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Vol. XXIV JANUARY 1930 No. 1

The EXCAVATING ENGINEER

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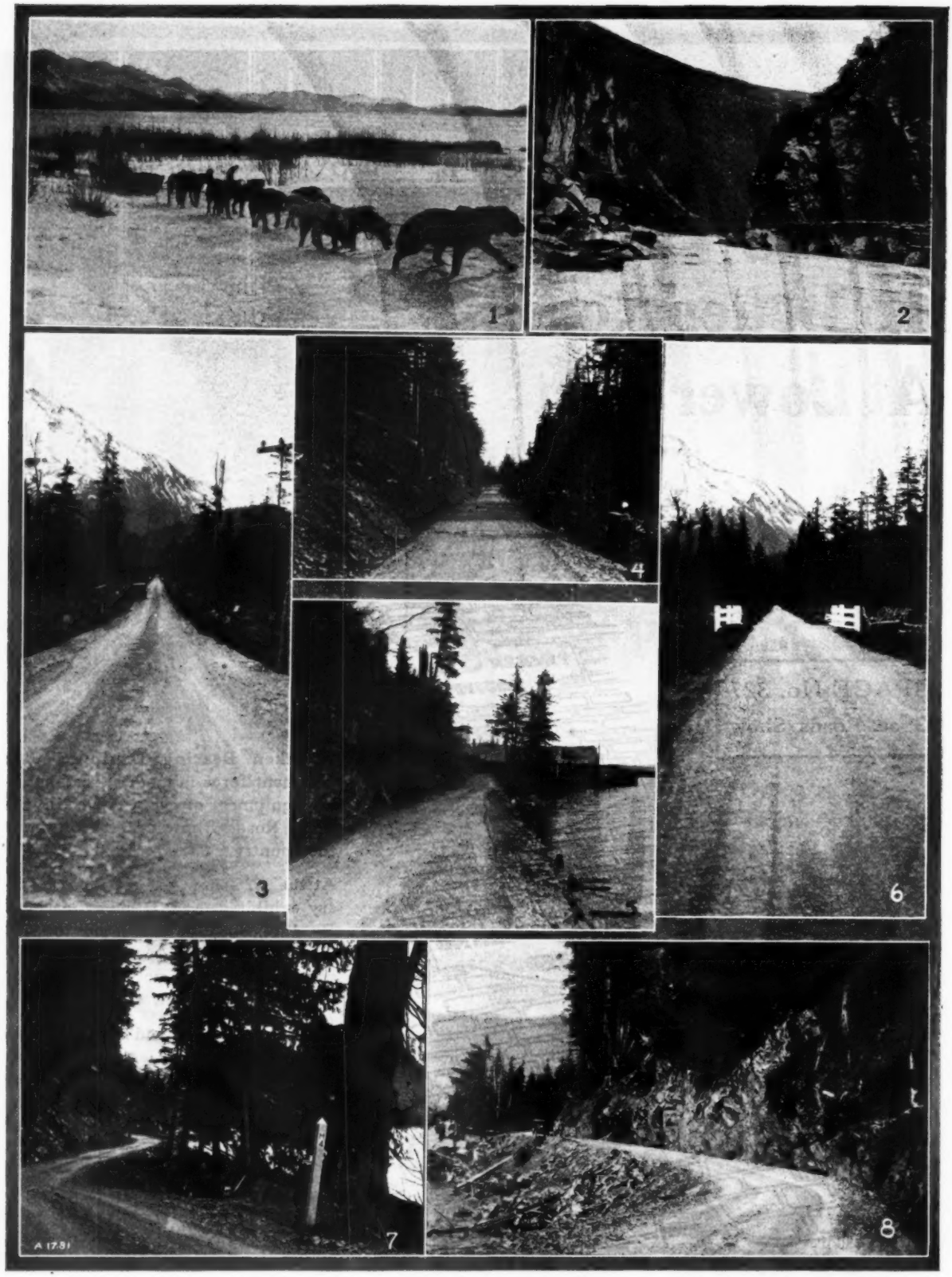


ALASKAN HIGHWAYS

1. Transporting United States mail by dog team. 2. On the Richardson Highway in Keystone Canyon. 3. Lake Kenai Highway near Seward. 4 and 5. Views on Ward Cove Road near Ketchikan. 6. Wild life abounds on every side of this Lake Kenia Highway near Lost River. 7 and 8. Beautiful scenery borders the National highways of Alaska.

The EXCAVATING ENGINEER

Vol. XXIV JANUARY 1930 No. 1

Alaska Builds Pioneer Highways

By N. M. DREW

. . . "Roads constitute a prime need in every new country, and our long national experience in pushing out highways ahead of the onrolling wave of settlement ought to convince us that the broadest liberality towards roads in Alaska will be certain to bring manifold returns" . . . . .

(From speech President Harding delivered in Seattle, July 27, 1923, upon his return from a tour of Interior Alaska.)

Passing through Keystone Canyon on Richardson Highway one finds some of the most beautiful scenery in Alaska.

THE highway problem in Alaska is one that should be of vital interest to every citizen of these United States. Has not the Territory since its purchase poured out bounteous rewards from an exhaustless reservoir?

Road construction in the Territory of Alaska is a slow and expensive process.

There are four kinds of roads in the classification of the Alaska Road Commission, viz., wagon roads, sled roads, trails and flagged trails.

Wagon Roads are roads that are cleared, grubbed, ditched, graded and drained sufficiently to accommodate wagon traffic. The roads constructed by the Commission are in general good wagon roads. However, a more substantial type of road has now been built in many places, upon which automobiles and light trucks can be used. The demand for roads of this type is increasing, and effort is made in each case to provide a gravel surface for the road. Gravel for road surfacing is usually available within a reasonable hauling distance. At the present stage of development in Alaska, however, concrete or other forms of hard-surfaced roads are not warranted in the opinion of the Commission.

Sled roads are cleared and grubbed like wagon roads, but are not graded. They are located on low ground, often swampy, and follow streams and lakes whenever this is advantageous. Their wearing surface is of snow, and they are drained only enough to prevent their destruction by the summer rains. Double bob-sleds, drawn by two, four or more horses, haul heavy loads over these sled roads.

Trails include any construction less than that of wagon roads or sled roads. These trails are suitable for dog-sleds or single horsedrawn double-ender in winter and pack trains in summer. Except where frozen river surfaces are used, some work is always necessary to permit the use of dog teams.

Flagged trails represent cut-offs across frozen lakes, arms of the sea, etc. The marks are neces-

sary to prevent travelers from getting lost in bad weather.

Three to Four Years Required for Subsoil to Thaw

After the road has been located, timber cut and removed, stumps grubbed out, moss and vegetation removed, drainage ditches dug and grading completed, it requires a period of three or four years for the subsoil to thaw, the ground water to be lowered to its new level, and the sub-soil to reach a stage of balance. In the meantime the road is unsuitable for heavy loads and maintenance charges are high. In many places it is impossible at any reasonable expense to grade and drain the roadway, and corduroy must be resorted to. Fortunately the scrub timber generally available makes good corduroy. Native timber is of insufficient strength and not very durable, hence fir is imported for all important bridges.

The high scale of wages and supplies in the territory of Alaska has been a serious drawback to the progress of road work. The rate paid for common labor averages from $3.50 to $6.00 per day with board. Besides this first high cost the nature of road work in Alaska adds to the cost in a way that comparison cannot be made with road work in the United States.

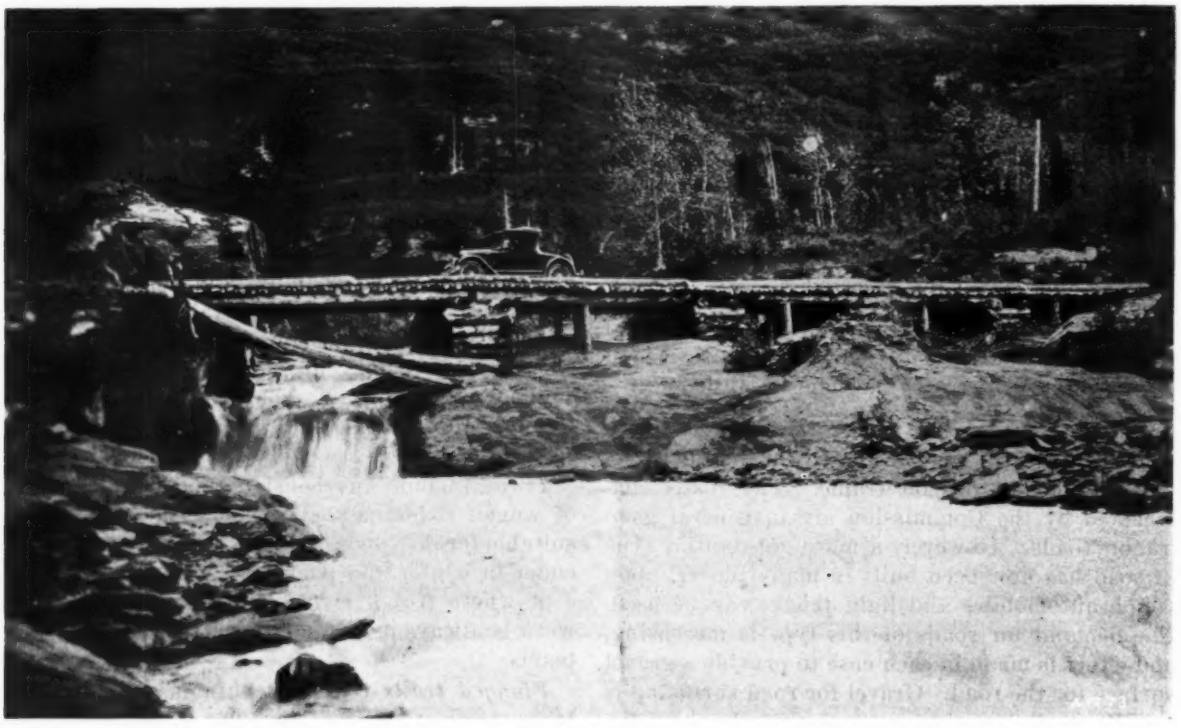
The general road and trail system of the Commission ties into the Alaska Railroad, operated by the Secretary of the Interior, at twenty-seven different stations. These highway and trail feeders to the Government Railroad are an important factor in increasing business for the railroad.

While construction is simple across glacial moraines the vagaries of glacier-fed streams must be guarded against.

Problems of Frontier

The magnitude of the task and extent of territory covered by the wide-flung activities of this Commission may be realized from the fact that it would take two years of continuous traveling with the best facilities available for a single individual to make a complete inspection of the entire mileage for which the Commission is responsible.

It would be necessary for one to visit the Territory and traverse parts of it not yet provided with roads or trails to appreciate the difficulties of transportation within Alaska. However, one with a good imagination can readily understand



Type of bridge in common use over glacial streams along the Richardson Highways.

the problems and difficulties. Alaska is a frontier country with an area of about one-fifth that of the United States proper, or 590,884 square miles. Its extreme length is 1100 miles and its extreme breadth is 800 miles. With its population of about 27,000 whites and an equal number of natives, it is in about the same stage of development as was our great western frontier at the time just preceding the Civil War.

Alaska is a country of very bold relief. Along the entire southern coast line from Portland Canal east of Ketchikan to False Pass at the southwest extremity of the Alaska Peninsula mountain ranges rise, abrupt and rugged, direct from the sea. This continuous chain of mountains along the coast has done much to retard the development of Alaska, since it presents to the visitor a forbidding and discouraging aspect, and it has always greatly increased the difficulties of access.

Beyond these mountains there lies a broad stretch of rolling upland country, comprising the valleys of the Copper, Susitna and Nushagak Rivers. The Copper and Susitna Rivers are the only rivers of any size that break through the continuous chain or coast ranges to drain into the Pacific Ocean. The Nushagak River flows parallel to the coast range and drains into the Bering Sea. Within the valleys of the Copper and Susitna Rivers rise two very rugged mountain groups known as the Wrangell and Talkeetna ranges.

Beyond the valleys of the Copper and Susitna Rivers the Alaska Range, which may be called the backbone of Alaska, rises to great heights. It includes Mount McKinley, the highest mountain of North America. The Alaska Range is broken by numerous narrow but excellent passes, and has not been a barrier to the territory as have the somewhat less high mountains which fringe the coast.

Beyond the Alaska Range there is a vast country, rolling and in part mountainous, which comprises the valleys of the Kuskokwim and of the Yukon with its two main tributaries, the Tanana and the Koyukuk. The lower valleys of the Kuskokwim and Yukon are flat delta.

Suspension bridge in Keystone Canyon near Valdez.

On Tongass Highway near Ketchikan.

The Brooks Range, consisting of mountains that are neither especially high nor very rugged, separates the valleys above mentioned from a vast stretch of rolling tundra which extends to the Arctic Ocean.

The frozen condition of the subsoil prevents the drainage of the surface by seepage, while the accumulated moss and dead vegetation greatly retards surface drainage. The result is that in proceeding across country in Alaska in its normal condition in summer one wades through a peat-like muck, watersoaked, and ankle to knee deep. The going is made rough by the profusion of bunches of grass root known locally as "niggerheads." This condition exists all over Alaska with the exception of the narrow fringe along the southern coast. Scrub timber also complicates movement across country, except on the Seward Peninsula and on the Arctic slope, and must be cleared to permit ready passage.

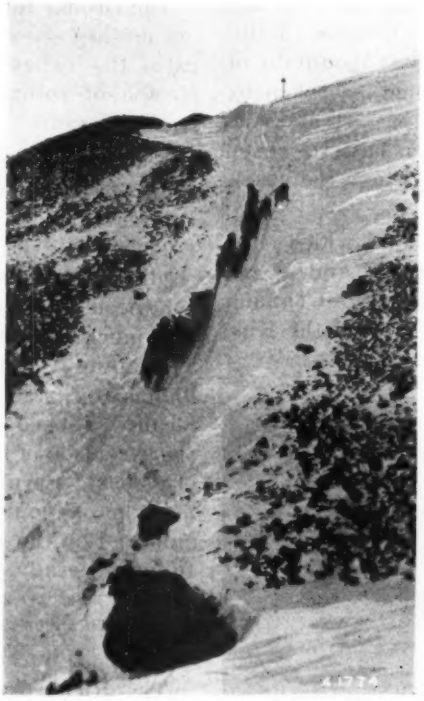
Rugged Scenery Brings Fame to Richardson Highway

The Richardson Highway is the name of the road extending from Valdez to Fairbanks, a dis-

In the early days mule wackers forded the streams as shown by the old trails below, but the modern highway employs suspension bridges of native timber such as the Bear Creek bridge shown at the right of the above illustration.

tance of 410 miles. The highway is an important traffic feeder, both to the Alaska Railroad and to the Copper River and Northwestern Railroad. With these two rail systems it forms a circle route, which has now become widely known on the outside as the Golden Belt Line Tour. Last season many hundreds of tourists made this truly magnificent scenic trip without any delays or inconveniences other than are incident to motoring in any mountainous country. The plans of the Commission contemplate the eventual extension of the Richardson Highway from Fairbanks to Circle, a distance of 160 miles. The section of the Richardson Highway passing through Keystone Canyon and across the southern part of the coast range is probably the most scenic route in Alaska and has required the most expensive construction.

The pioneer period of the Alaska Road Commission is largely over. The effort of the Alaska Road Commission has resulted in a speeding up of development work upon a unified plan, passed upon by a careful survey of the situation and thorough knowledge of the entire territory. All existing mileage has been opened and improved so far as funds have permitted. The present network of roads serves as a certain guide for the future development of overland routes through the territory. This development only calls for additional funds for construction.



"Mushing" in Alaska.

Danger Lies In Glacial Streams

Many of Alaska's streams are of glacial origin. In these the water is very cold and heavily laden with silt, and the current is very swift. Quicksand is often encountered. Such streams are always crossed at considerable hazard. During the winter, extending on an average for the whole interior country from November first to April tenth, the streams are frozen over and the ground covered

A pretty piece of grade on Lake Kenia Highway.

with snow and movement is much less difficult. The stream beds generally form excellent avenues for movement by dogsled or horse-drawn sleds. Winter travel on the large streams is more or less hazardous though, due to danger from overflow or of going through holes or thin places in the ice. The trails are gradually being relocated off the river in such places. During the period from October tenth to November first, and from April tenth to May tenth, as an average for the interior country, the streams are just freezing or thawing, and movement on or across the streams is impossible on account of running ice, and travel is at a standstill except on the railroads.

Freighting to New Diggings at One Dollar the Pound

In the interior the great cost of moving freight by teaming or packing, together with the difficulty and uncertainty of moving it at all, constitute the main obstacle to the growth and development of the territory of Alaska. Some of the mining camps in the interior have been almost

(Continued on page 27.)

CHUQUICAMATA . . . .

where giants work

One of the workers out of the past dug up from this great Chilean copper mine.

By NINA LANE

CHUQUICAMATA, hanging between eight and ten thousand feet in the Occidental Cordilleras, is the property of the Chile Exploration Company. It is probably the largest copper deposit in the world.

"Chuqui," as the property is called, not only through affection but because it is short and easy to pronounce, overlooks a wide stretch of pampa lying at the eight-thousand-foot level. At the left are the perpetually snow-covered peaks of San Pedro and San Pablo, while on the distant horizon in the Puna Atacama, rears the Fujiama of Chile; Licancauer.

From Chuqui, one can see the clouds of dust on the toro trail as cattle from the Argentine emerge from the passes. Weary and foot-sore they are driven toward the alfalfa fields of the oasis of Calama seen glimmering in the distant heat. There they will rest before their last long trek to the nitrate pampas at the four-thousand-foot level, as food supply for the workers. Were it not for the fact that the cattle are shod before leaving the Argentine, and given a few days of rest in the oasis of San Pedro de Atacama, they could never make the trip. Three deserts, with at least twenty-four hours between draughts of salt-laden water, not to mention the cruel heat blown over the glaring volcanic sands by an almost unceasing wind, climbing from pampa to mountain and down again into pampa, tries the endurance of the strongest.

Bucyrus-Erie 8-yard electric loading ore in this great Chilean copper mine.

Chuqui from a distance appears as though some Colossus were indulging in landscape gardening. Cutting a desert mountain into terraces — huge terraces half-circling the mountain. At the right is the tailings dump — to be planted at some future date, while the ripio dump is spread at the foot — a huge ripio dump one mile long and three-quarters of a mile wide and two hundred feet high. What a wonderful dance floor it would make for the giants who are to play in the garden.

The old and the new — modern electric, heavy-duty, full-revolving shovels such as we see at right and left are replacing the older, sturdy, but not so economical machines as typified by the old Panama shovels in the center.

Typical rock formation of Chuqui.

Mining Here Goes Back Hundreds of Years

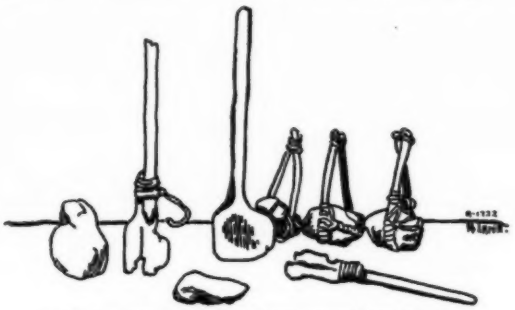
For hundreds of years before the advent of the Colossus, men, individuals and groups had gophered the mountain.

Brown men in homespun wool, closely wrapped in brightly-colored ponchos, came up out of the desert from the oases watered by the Loa. They came with water-skin, wooden shovel and stone mallets lashed to the backs of llamas. Llamas can do without water, and there is no water in the high places of the Occidental Cordilleras. The skins of water were for the men.

Later came the children of these same men, with tools but little improved. They came sullenly and stolidly — driven by the lash of the conquistadores.

Later still came Europeans who hired the brown men for coins — small coins, or for a share of the ore which they tore from the hard ribs of the mountain. The Colossus smiles as he thinks of the tools they used and their method of getting the ore.

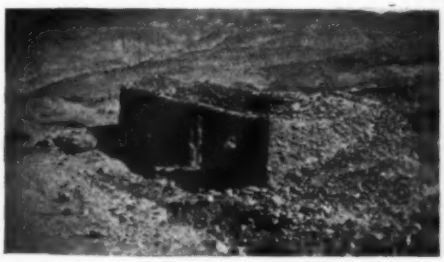
In the burrows made by the first men have been found the tools with which they worked — the original primitive forms from which germinated the machines that today tear down mountains, chew them up and throw them away. The daddy of the Bucyrus-Erie shovels, the electric drills and all the rest that enable men to do the work of gods. Often the workers of ancient days are found — crouched where they were caught by a fall of earth. Crouched with stone mallet and half-filled rawhide pouch of ore by their side! Shreds of clothing cling to their mummified bodies and patches of hair to their dried skulls — patient workers patiently awaiting their release.



Noble ancestors all; these poor but honest parents of the giant excavators of today!

What Would These Primitive Workers Think of Present-Day Production of a Mountain of 80,000 Tons of Ore in a Single Day?

Contrasts are always interesting. The brewery horse of yesteryear, colossul descendant of a miniature prehistoric ancestor is contrast. The Chuqui daddy of the Bucyrus-Erie shovel is so great



Staff House

Smelter

Shaft

Showing ancient mining methods at Chuqui

Note the drills "making hole" ahead of this husky successor to the primitive shovels of the early Indian miners.

in contrast that it ceases to be such. Made of wood, often with blade lashed to a handle with rawhide thongs, it is from 26 to 33 inches in length, while the blade averages 6 inches in width. With a mallet of stone, measuring 8 x 5 inches, lashed to handles of wood to loosen the ore, the original Chuqui miner did not move much ore in a day. What would he think of a flock of shovels that removes 80,000 tons in one working day, as is done now?

Twenty electric shovels working often three shifts of eight hours each! Twenty huge dippers lifting and loading the copper bearing ore into waiting cars from eleven benches!

Sometimes the shovels lift bodily an old digging. Dig a "hole" out of as well as into the mountainside. One day, while a huge Bucyrus-Erie was grabbing a mouthful of ore it gobbled an old digging. It was the last dipperful of the shift. Dusk was falling. There was a wild yell from the cab — the bucket stopped in mid-air. The operator, pop-eyed, jumped from the cab and without a look behind him, started running! The rest of the crew stopped in amazement, and then, looking for the cause of such unwonted conduct on the part of one of their number, soon found what they were looking for. With one accord they, as a certain Book says, "went away from that place" nor heeded they the manner of their going. Seated calmly in the high-swung bucket, head and shoulders above the edge, with ore piled around him, sat a man! Hollow eyes seemed to follow the retreating crew. He was serenely quiet, nor moved he one whit — he was dead! Had probably been dead for three hundred years. A mummy. One of the workers from out of the past. He surveyed the scene of his former activities as tranquilly as though he were perfectly familiar with them.

Once a man, entirely copperized, was found. He was a large man — larger than the men inhabiting the country today. He can be seen in the Museum of Natural History in New York.

All of the shovels being used at the mine are operated by electricity, with the exception of the two or three Diesels used for cleaning up after shots, so that ore trains can operate, and for stripping on the upper levels. When one considers the amount that must be cleaned up after a shot they

(Continued on Page 56.)

Bucyrus-Erie spreader plow in action on waste dump.

It takes a lot of dirt to fill the giant wagons which are becoming so popular with the up-to-date contractor, but the 2-yard Bucyrus-Erie with its powerful Atlas-Diesel engines makes quick work of loading these big Le Tourneaus to overflowing.

California contractors rush grading of Southern Pacific bridge approach

By GEO. C. MCNUTT

Southern Pacific spending $12,000,000 to bridge San Francisco Bay and cut 30 minutes from train schedules.

IN an age when it is possible to go from Los Angeles to London in eight days, when the earth is circled in 17 days, minutes take on a new significance, they become more important in the commerce of the world. This age will not brook unnecessary delay.

Because this is an age concerned with the salvage of minutes, the Southern Pacific Railroad is building a bridge across Carquinez Strait in San Francisco Bay to replace the ferry which for more than thirty years has carried trains between Benicia and Port Costa on the express run from San Francisco and the East.

Here is one of the Le Tourneau 16-yard dump wagons behind a Caterpillar "60" backing in on the dump.

This bridge will cost $12,000,000, and is to be completed by December, 1930. It will cut thirty minutes from the running time between San Francisco and Eastern and Northern points — $400,000 a minute!

Contractors Work Day and Night

Earth-moving crews are working night and day, two 11-hour shifts daily, to finish the preliminary work of grading. It is interesting to note the somewhat unique system of changing shifts which has been working out very successfully. One shift works from midnight to 11:30 a. m. with a half hour off for lunch. The other shift works from

One of the Le Tourneau wagons spreading the dirt in a shallow fill.

12:30 p. m. to midnight with the same time off for lunch. This gives the mechanics one hour in the middle of the day to make any necessary adjustments, and divides the shifts so that there is little choice between them and therefore more contentment prevails.

The work involves two grading jobs, one on either side of Suisun Bay, 30 miles east of San Francisco. George Pollock, Sacramento contractor, had the Martinez approach on the western side of the bridge cutting through a high hill and sloping down through a dense industrial district. Mr. Pollock's equipment consists of two Marion 2-yard shovels, one 1-yard P. & H. dragline, 15 6-yard Sterling trucks, a Freeman truck turntable, two bull-dozers pushed by Caterpillar 60's, one Caterpillar 30 and a Sullivan air compressor.

R. G. Le Tourneau of Stockton, California, who a year ago completed a large railroad grade near Fresno in record time, handled the grading on the north approach. The work consisted of a long approach grade with a 70-foot cut near the bridgehead, the yardage running over 400,000 yards.

Every effort was made to rush the work through as promptly as possible, and in order to save hauling $3,000 was paid for 200,000 cubic yards of earth across the highway from the main fill. This main fill extends to the edge of an arm of Suisun Marsh, and has to be high enough to carry

Contractor Pollock uses Freeman truck turntable on the Martinez approach to speed up the hauling with his 6-yard Sterlings.

an 860-foot steel viaduct across to the cut near the bridgehead.

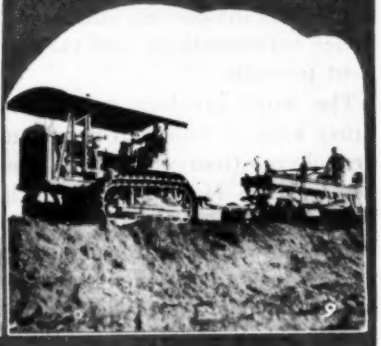
Believe in Large Capacity Equipment

Le Tourneau used on this job a Bucyrus-Erie 50-B Diesel shovel, a 1½-ton truck, 6 Caterpillar Sixty tractors, 5 16-yard dump carts, a 3-ton rooter, 7-yard and 12-yard scrapers, and a bull-dozer. Much of the latter equipment was designed by R. G. Le Tourneau, and built by him in his shop at Stockton for just such tough jobs as this one. Mr. Le Tourneau believes that a contractor should always have equipment of maximum capacity, and should work that equipment to capacity all of the time. It is in furtherance of this theory of his that he had developed the large capacity equipment used on his recent contracts.

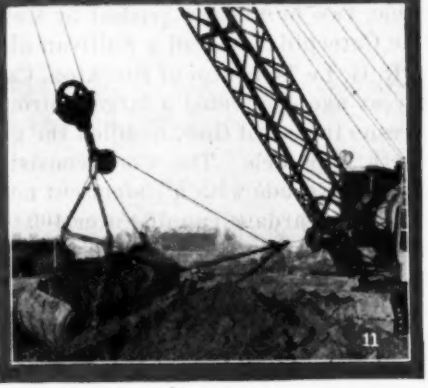
A pretty piece of fill. Here we have a Caterpillar "60" spreading dirt with one of Le Tourneau's giant scrapers.

The Le Tourneau 12-yard scraper is made with telescoping buckets which slide back as the scraper fills. To force the dirt out, the sections are pushed forward by an electric motor and the blade lifted. The 7-yard scrapers operate from the power taken off the tractor. With either scraper arrangements

(Continued on page 58.)



1. Borrow pit. 2. No trouble loading to the Internationals. 3. Dumping from slab. 4. Caterpillar Sixty handling grader. 5. A chip off the old block — young Kestle is making his start at the levers of the Bucyrus-Erie Gas + Air. 6. B-2 building ditch and shoulder. 7. Through rich black soil of Iowa corn land. 8. Occasionally trucks hauled the dirt short distances. 9. Caterpillar and Russell Mogul graded shoulder. 10. Digging here on both sides. 11. Heaping full at every pass.



Building shoulders on Iowa highway

▲ ▲ ▲ ▲

Dragline and shovel used to build shoulders and open ditches along concrete paving laid on old grade.

General view of the shoulder building operations on the Kestle job. Mr. Joost of Wm. H. Ziegler Company is on the running board of the Gas + Air.

WALTER S. KESTLE, hustling contractor of Faribault, Minnesota, has been doing some neat work this past fall in building shoulders on 11.9 miles of new 18-foot paving located on Iowa State Highway No. 11 south of Independence. The work, subcontracted from contractor Boyette, was estimated at 99,000 cubic yards but will overrun that amount considerably.

The paving was laid during the summer along an old grade, and after it had set shoulders were built from material removed from ditches and borrow pits alongside the road.

Two power excavators were used on the Kestle job, a Bucyrus-Erie Gas + Air dragline and a Bucyrus-Erie B-2 steam shovel. The dragline worked the stations where the borrow was all on one side, casting the dirt to shoulder both sides. Where borrow was required on both sides, the Type B shovel was used, casting from the ditch into the shoulder. After the material was cast into place, a Caterpillar tractor and Russell Mogul grader leveled off the shoulder and trimmed up the borrow pits and ditches to specified grade and slopes. Two International dump trucks were used to haul dirt when hauling was required, though most of the material was cast direct from borrow to place.

The Kestle organization is especially enthusiastic about the Gas + Air. Working steadily on casting she burned about 50 gallons of gas per day, according to Walter Kestle, Jr., who operates the dragline. He made an average of six stations a day with the dragline, with the dirt running over 150 yards to the station. This was the average on casting where he works both sides. The Gas + Air made as high as nine stations in a day's work, however, where going was particularly good.

Joe De Mars, who operates the B-2, is also doing some good work and stepping right along, leaving a clean ditch and neat shoulder behind him.

Excavation for 1930 Highway Construction

THROUGH the co-operation of the State and Provincial Highway Departments of the United States and Canada, *The Excavating Engineer* presents a brief outline showing estimates of excavation for highway construction contemplated for the coming year in the various states and provinces. It must be understood, of course, that figures given are advance estimates and, therefore, are only approximate. The estimates given are carefully prepared for us by the state and provincial highway departments (except as noted) and confidence may be placed in the accuracy of the reports so far as estimates can be considered accurate under the circumstances.

It is probably safe to forecast that these estimated programs are, as a whole, under rather than over the actual work which will be done. The efforts of President Hoover and the various State Administrations to stabilize business conditions by releasing increased public work during the coming year will probably have a marked effect in enlarging highway programs. The Phipps-Dowell bills now before Congress provide for an increase of from 75 to 125 millions per year for the next three years in the Federal government's appropriation for Federal Aid highways. Passage of this bill, which has the approval of a vast majority of the country's 25,000,000 motorists, and the indorsement of President Hoover's message to Congress recommending an increase in the Federal government share of financing, will, of course, mean corresponding increases in most of the state programs given below.

In general the data presented represents figures for Federal and State highway construction, but does not include such road construction as is planned by counties, cities, and towns.

Highway Construction

From a summary of the report of Samuel Eckels, American Association of State Highway Officials, submitted to the National Business Survey Conference held under the auspices of the Chamber of Commerce of the United States at Washington, D. C., December 5, 1929.

Highway construction, because of the fact that nearly 50 per cent of the expenditure is paid to labor, and because a large program may be quickly inaugurated, is especially suited to assist in a prosperity program.

There is no doubt but that a large highway program would stimulate prosperity. This could be quickly realized and would give immediate relief to the unemployed.

Highway construction approached its peak in 1928, remained about the same in 1929, and the indications are for an increase in 1930.

With these expenditures, however, construction is not keeping pace with traffic demands. In addition to the state programs including an expenditure in excess of one billion dollars, the counties and cities together are spending in excess of one billion annually on highway construction and maintenance.

To bring about increased highway programs, it is suggested that there be an increase in the amount of Federal Aid, which is a practical incentive for states to increase their appropriation for road construction.

Alabama

One and one-half million yards of excavation is expected to develop in construction of 300 miles of new grading planned for 1930 by Alabama. About one-third of this will be suitable for shovel excavation. Estimated expenditure for this work will be $1,800,000, about $500,000 of which will be for 50 miles of Federal Aid roads, while the balance of $1,300,000 will go to build 250 miles of State Roads. In addition, about two million yards of excavation, costing $600,000, will be carried over from 1929 contracts. It is expected that 50 miles of paving will be laid in 1930, costing $800,000.

Arizona

During 1929 Arizona spent approximately $7,200,000 for highway and bridges exclusive of maintenance. It is probable that the 1930 program will involve about the same expenditure.

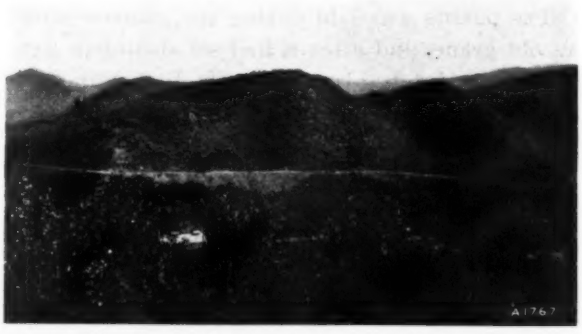
Arkansas

Three and one-quarter million dollars is the estimated amount that Arkansas will spend for grading 236 miles and reconstructing 365 miles of her highway system. The work will probably involve about 2,360,000 cubic yards of excavation, to which may be added 1,000,000 yards left over from 1929 contracts. Paving 288 miles at an approximate cost of $7,200,000, and graveling 200 miles at estimated cost of $2,000,000, are also on the present Arkansas program.

California

On the California State Highway System only, for the year of 1930, it is contemplated to grade approximately 125 miles of new road at an estimated expenditure of $4,300,000; 45 miles of reconstruction of grade and widening grade at an estimated expenditure of $1,300,000; 145 miles of surfacing of roads already graded at an expenditure of $560,000. Paving of roads using various types of paving amounts to 236 miles at an estimated expenditure of $8,725,000. No information is available regarding the county roads or other local roads, nor are estimates available at the present time regarding the amount of yardage involved in the grading of these roads.

Colorado



One of the Colorado highway jobs on the 1929 program was the construction of the new short cut from Oak Creek to Steamboat Springs along the side of the Oak Creek foothills.

The highway program for Colorado will involve a million yards of excavation, about 40% of which will be suitable for shovel operation. This will include both reconstruction and construction of new grades where necessary on 280 miles of Federal Aid roads and 125 miles of State Roads, involving an expenditure of about $4,000,000. In addition, about one million yards of excavation are carried over on previous contracts, involving an expenditure of approximately $3,000,000. 1930 paving in Colorado will cost about $2,300,000 and will lay slab on 38 miles. 105 miles of graveling and 115 miles of oil surfacing will probably involve an additional expenditure of $1,500,000.

Connecticut

The Highway Department of Connecticut expects to build 20 to 30 miles of new grading at an expenditure of $1,500,000. Of this probably about 5 miles, costing $400,000, will be Federal Aid, the balance being on State highways. Reconstruction will improve an additional 100 miles of highway at a cost of five million dollars, only about 10% of which will be Federal Aid. The new grading is expected to require 75,000 cubic yards of excavation; the reconstruction 650,000 cubic yards. In addition work costing one million dollars and involving 20,000 cubic yards of excavation will be carried over on incompleted 1929 contracts. As a rough estimate it is expected that about 120 miles of paving will be laid costing about six million dollars.

Delaware

While Delaware expects to excavate 235,000 cubic yards in her 1930 highway improvement program, only about 15% of this will be desirable shovel excavation. 1929 contracts have all been completed. It is expected that 40 miles of paving will be laid at cost of $1,000,000, and in addition 20 miles of traffic bound gravel is on the present program at an estimated cost of $160,000.

Florida

The 1930 budget for Florida has not been prepared yet, but we hope to report her program in an early issue.

Georgia

Georgia plans to increase her highway program from $10,800,000, the approximate expenditure for 1929, to $12,000,000 for the 1930 program.

Idaho

The extent of Idaho's highway program for 1930 will depend largely on what Federal Aid appropriations are made by the present session of Congress. Based on existing authorizations it is expected that the Idaho construction program will total about two and one-quarter million dollars, with an additional million to be spent on reconstruction and oil treatment.

Illinois

A large portion of the funds which Illinois anticipated using for her 1930 highway construction program would have been derived from the proceeds of the motor fuel tax passed by the last General Assembly. Several injunctions have been filed seeking to restrain the depositing of a portion of this tax money in the State Treasury. Until these injunctions have been settled and a favorable decision given as to the legality of the motor fuel tax, it will be impossible to outline an Illinois highway construction program.

To November 21, 1929, Illinois built new grades for 16 miles of Federal Aid highways and 130 miles of State highways, involving a total of 5,142,982 cubic yards of excavation. About 1,500,000 of excavation on present contracts will be carried over into 1930. Paving completed during 1929 totaled 741 miles, while only two miles of road was graveled.

Indiana

During 1930 Indiana expects to build approximately 550 miles of hard surface State roads including all necessary grading and structures at a cost estimated at $15,000,000. Practically all of this will be improvements in existing roads. No accurate estimate can be made at this time of yardage of excavation or expenditure involved.

Iowa

The Iowa highway program for the coming year will be rather extensive. It will probably include 800 miles of pavement, 300 to 400 miles of heavy grading work and gravel surfacing work. In addition to this there will be, probably, a rather substantial secondary road program going on in the way of grading and gravel surfacing. Iowa's paving work will probably require an average of about 10,000 cubic yards of gravel per mile of paving. The grading program is expected to average about 25,000 to 30,000 cubic yards of excavation per mile of grading. Secondary grading is considerably lighter as a rule, and can be estimated from 5,000 to 6,000 yards per mile. As a rule the nature of the country through Iowa does not necessitate shovels for highway grading, although in some sections shovel excavation can be used to advantage. On their type of grading, draglines are being used by a number of Iowa contractors to very good advantage.

Kansas

Kansas expects to do about 700 miles of new grading during 1930 at an expenditure of $3,500,000. In addition to this will be county and local road construction. There will also be probably sand and gravel replacement on about 2,300 miles at an expenditure of $1,300,000. It is estimated that the grading of new roads will involve 7,000,000 cubic yards of excavation, about 10% of which will be suitable for shovel work. The use of draglines would, of course, be practical on considerable of the 90%. About $2,000,000 worth of grading is being carried over on 1929 incomplete contracts. Kansas expects to pave about 70 miles at the cost of $1,500,000, and gravel 700 miles at an expenditure of $1,200,000. Bridges will probably involve an expenditure of $1,300,000.

Kentucky

On Federal Road No. 50 in Kentucky, Hodgkin, Adams & Company of Winchester used Caterpillar Sixties and Athey wagons to keep the dirt moving from their Bucyrus-Erie Type B-2.

The program of the Kentucky State Highway Commission covers the biennial period beginning April 1, 1930 and ending March 31, 1932. It is expected that in this period Kentucky will build about 670 miles of new grading at an expenditure of $8,400,000, and will reconstruct, widen, etc., about 100 miles at an expenditure of $450,000. It is estimated that approximately 8,000,000 cubic yards of excavation will be involved in the new road grading, and 300,000 cubic yards in the reconstruction. About 65% of this excavation will be suitable for shovel operation. In addition to the above approximately 3,500,000 cubic yards of excavation is being carried over from old contracts and will cost approximately $4,000,000. Paving for the coming biennial period will probably cover 75 miles at a cost of $2,000,000. Gravel and traffic

(Continued on Page 28.)

The EXCAVATING ENGINEER

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The Business Situation

To review the business of the year just passed, and to take tally of the prospects for the year to come, seems to be the logical thing to do at this season. Let us look at the prospects for 1930. One of the most important needs for business activity is reasonably cheap money. The rates for both call money and time money are adjusting themselves rapidly, and on the first of last month were down almost to the average of the years 1923-25.

One of the most important factors in business is the activity of the construction industry; it is probably the most reliable single indicator.

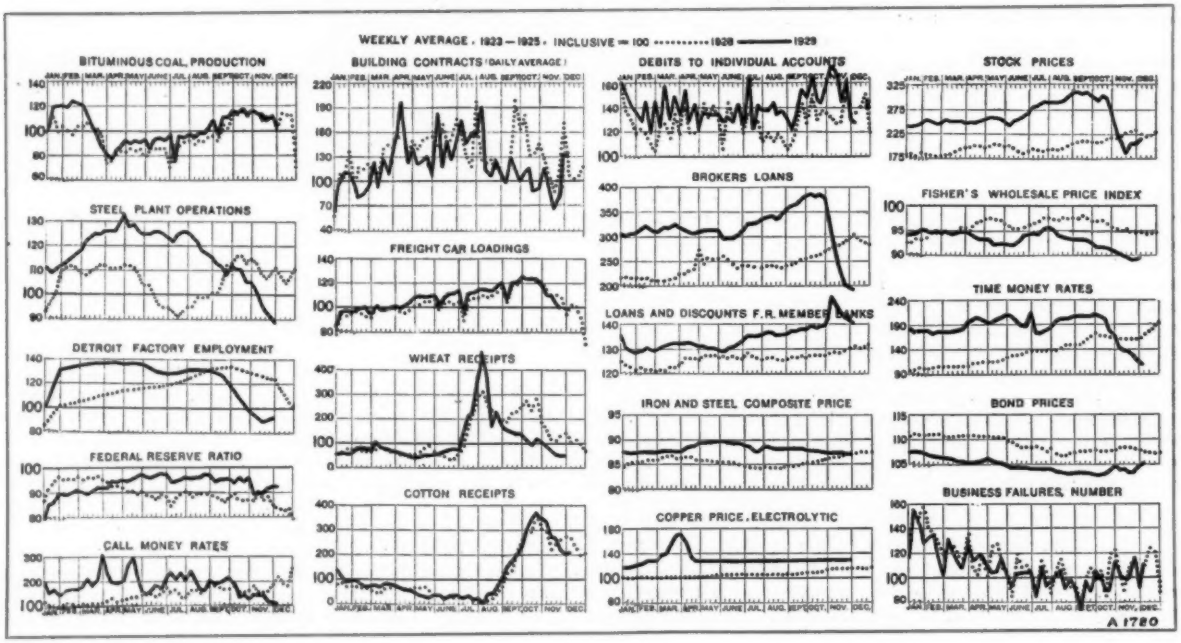
F. W. Dodge Corporation are predicting that the building total for 1930 will show a moderate increase over that of last year. The Federal government, state governments, municipalities, railroads, public utilities and other bodies are planning on proceeding with construction work to an even larger extent than last year. Such items as a $40,000,000 expenditure for addition to the E. I. du Pont de Nemours and Company's plants in West Virginia, and a $25,000,000 plant for the Great Lakes Steel Corporation at Detroit, suggest that any dropping off in apartment house and residential building will be made up for by other work. Special attention should be given to such programs as the announced intentions of the railroads to spend $800,000,000 to $1,000,000,000 this year on right-of-way and rolling stock, and the public utilities to spend $1,800,000,000 on new plants and distributing facilities.

Industry itself is not in a weak condition; inventories are not high; commodity prices are normal and the banking system is strong.

The outlook is not gloomy, although the recent stock market decline has been responsible for many a long face. The essential fact, wherein the present differs from most periods immediately following great stock market declines, is that business itself is healthy and has not been involved in over-expansion — which means (we quote the National City Company here) that an attack of acute indigestion in securities, while it may cause business a severe headache, should not seriously cripple the patient.

And now let us look back at 1929. Money rates, normal during early 1928, climbed steadily until October 1929, and were probably an important cause of the 12 per cent decrease from 1928 shown by the construction industry for the first eleven months of 1929. The automobile industry has completed a year's production estimated to be 24 per cent larger than that for 1928, steel plant operations, after continuing at a high rate all year, have been tapering off and are running a little less than 70 per cent of rated capacity. The mills produced in the first ten months of 1929 almost 96 per cent of the entire output for 1928. The bituminous coal producer enjoyed a better year in 1929 than in 1928.

WEEKLY BUSINESS INDICATORS



The past year has been a remarkably good one for almost all business, and although the volume of business in the second half will probably prove to be somewhat smaller than that in the first half, the year should prove to compare very favorably with the average of the last few years.

As to recent developments F. W. Dodge Corporation report that, during the month of November, construction contracts were awarded to the extent of $391,012,500 in the 37 states east of the Rocky Mountains. These states include about 91 per cent of the total construction volume of the country. The decline from the October total ($445,642,300) was a little more than $54,000,000, or 12 per cent. The decrease from the November 1928 total ($471,482,200) was about $80,000,000, or 17 per cent. The New York and Northern New Jersey District and the Northwest were the only two districts showing increases over the October 1929 and November 1928 records.

The November construction record brought the amount of new building and engineering work started in the 37 states since the first of this year up to $5,437,922,400 as compared with $6,195,529,800 for the corresponding period of last year, the decrease being 12 per cent.

Our Front Cover

This month our front cover shows a pretty piece of road work in Jackson County, Missouri. H. C. Botsford, live-wire contractor of Kansas City, started this fourteen-mile grading contract on Colborn Road for Jackson County in April, and will finish up next spring. The work involves one hundred and sixty thousand cubic yards of excavation; the new grade extending from a point north of Lee's Summit to Sni Mills. The heavy cuts are being handled by the Bucyrus-Erie Diesel + Air shown in the illustrations, and loading into La Plant-Choate 8-yard crawler-mounted wagons drawn by Caterpillar tractors. A Caterpillar is also used with bulldozer on the dumps. Lighter grading is being handled by elevating graders and team gangs.

H. C. Botsford's Bucyrus-Erie Diesel + Air cutting through rock cut on Colborn Road.

The work is being handled for the County by Stayton and Veatch, Consulting Engineers, of Kansas City. Bridges are being built by Contractor C. A. Mustion. This piece of highway will be paved this coming summer.

CONVENTIONS

American Road Builders' Association
(and "ROAD SHOW")
Atlantic City, N. J. January 13th to 18th, Inclusive

National Crushed Stone Association
Cincinnati, Ohio. January 20th to 22nd, Inclusive

Associated General Contractors
New Orleans, La. January 20th to 25th, Inclusive

National Sand & Gravel Association
Memphis, Tenn. January 28th to 30th, Inclusive

Alaska Builds Pioneer Highways

(Continued from page 16.)

forced into abandonment on account of difficulty in getting their supplies into camp. Good roads necessary to feed the railroad and areas surrounding it should extend some distance from the railroad line, as the last connecting link between steamship or railroad and the home or camp is a wagon or a truck.

Richardson Highway 16 miles above Valdez.

A traffic census begun by the Commission in 1911 shows the annual saving in cost of transportation of freight due to the construction of roads by the Commission to be in excess of $2,000,000. It is doubtful, however, if anything like that amount of freight would have been transported without the roads and trails, and the indirect loss that would have been occasioned by the restriction on output and development if the roads did not exist cannot be estimated. During the opening of the new diggings in the Chisana Region a few years ago, beans, coffee, sugar, hay, candles, bacon, grain, etc., were sold at $1.50 a pound. The freight charges were almost a dollar a pound, so that the original cost of the article was of relatively little importance. And even at that, the supply could not keep pace with the demand.

1930 Highway Forecasts

(Continued from Page 25.)

bound surfacing is expected to improve 700 miles at a cost of $3,500,000, while black top for existing gravel and traffic-bound highways will improve an additional 200 miles at a cost of $1,500,000.

Louisiana

Grading of 20 miles of Federal Aid road will be done at a cost of $80,000, and 40 miles of State road, at an expenditure of $160,000, is included in the Louisiana 1930 program at this time. Ten miles of state road construction will probably add another $30,000 to the budget. Involved in the above is the excavation of 360,000 cubic yards for the new roads, and 30,000 cubic yards for reconstruction. About 25% of this will be suitable for shovel excavation. In addition to the work mentioned above, 2,000,000 yards of excavation, costing $500,000, will be carried on from 1929 incompleted contracts. Louisiana also expects to pave 550 miles at the cost of $13,750,000, and 200 miles of gravel at a cost of $1,600,000. The Highway Commission will probably also spend $3,000,000 for bridges and $3,000,000 for maintenance of present highways.

Maine

The program of the State Highway Commission of Maine for 1930 has not been fully decided upon. The Excavating Engineer hopes to present the Maine program in an early issue.

Louis Julian's Bucyrus-Erie Gas + Air borrowing boulders and gravel from a Massachusetts creek and casting to grade in the rebuilding of the famous Mohawk Trail.

During 1929 Maine reconstructed approximately 54 miles of Federal Aid and 41 miles of State roads, involving 500,000 cubic yards of excavation. About 80 per cent of this was shovel work. In addition about 15,000 cubic yards of excavation will be carried over into 1930. Maine paved in 1929 about 26 miles and graveled about 69 miles of highway.

Maryland

Grading 245 miles of new roads is expected to cost Maryland about nine and one-half million dollars in 1930. New roads will involve 1,275,000 cubic yards of excavation, about 60 per cent of which will be particularly suitable for shovel work. 90,000 cubic yards of additional excavation is expected to be involved in reconstruction. It is also expected that the State Roads Commission will let 190 miles of paving and 55 miles of graveling.

Massachusetts

Total construction work, partly on new locations but mostly in connection with existing roads in Massachusetts, will involve grading of 65 miles at an expenditure of $5,800,000. This includes Federal Aid and will involve 700,000 cubic yards of excavation. In addition, 1,400,000 cubic yards of excavation is estimated for the reconstruction program, which will involve about 245 miles and cost approximately $9,000,000. Of this, State and Federal Aid road improvements will cost approximately one-half and cover about 80 miles. Town, county and State roads (state aid) will total the other $4,500,000, covering a distance of 165 miles. Massachusetts will probably pave about 250 miles at an estimated cost of $13,800,000 and gravel 60 miles at a cost of $1,000,000. About 50 miles of the State Aid work included in the 165 miles of reconstruction mentioned above will be done by town forces.

Michigan

During 1930 Michigan will expend approximately $23,000,000 on construction of roads, bridges and grade separations. Of this amount approximately two and one-half millions will go for bridges and grade separations.

While there is as yet no definite program, approximately 550 miles of new and reconstructed road will probably be built, including about 75 miles of concrete widening. This work will involve about 6,000,000 cubic yards of excavation, about 25 per cent of which will be suitable for shovel operation. An additional two million yards to cost about $800,000 is being carried over on uncompleted 1929 contracts. It is estimated that Michigan will pave about 300 miles at a cost of $9,950,000, and will surface with gravel about 75 miles at a cost near $975,000. A large part of Michigan road construction work will actually be rebuilding old gravel roads to concrete roads, and since grades and drainage structures must be widened to take care of present traffic needs this work will be practically as expensive as if it were 100 per cent new construction.

Minnesota

The State of Minnesota Department of Highways is planning grading of 230 miles of Federal Aid roads at a cost of $3,680,000 and an additional expenditure of $1,600,000 on 750 miles of State Aid roads. In addition county highway construction is estimated to amount to $10,500,000 while other local road work will probably total $6,500,000. It is estimated that the work on new grades will involve approximately 5,650,000 cubic yards of excavation, about 30 per cent of which will be suitable for shovel work. In addition 1,100,000 cubic yards will be carried over from 1929 contracts at a cost of approximately $325,000. Minnesota expects to do about 225 miles of paving at a cost of $6,075,000 and 230 miles of graveling at a cost of $450,000.

Mississippi

The Mississippi Legislature meeting in regular session during January will decide upon the highway program for this state for 1930. During 1929 construction of highways in Mississippi was very limited due to the lack of highway legislation. Formerly Mississippi relied solely on matching county funds with Federal Aid for construction, but with

Grading one of Michigan's State Highways in Kalamazoo County. A recent picture, showing a Bucyrus-Erie Type 1035 owned by Adams & Lotte of Kalamazoo cleaning up some of the fall work.

the Government no longer allowing anything but state funds to be used in matching Federal Aid, this state's program has been automatically stopped. Work completed during 1929 consisted of 49.8 miles of drained and graded road, 68.3 miles of gravel surfacing, 4.3 miles of concrete and one-half mile of asphalt. In addition a bridge across the Yazoo River north of Vicksburg was built at a cost of $400,000, and Hinds County built 16½ miles of concrete pavement between Raymond and Utica under supervision of the state. There is still under construction 68.3 miles of road and two bridges, one across Biloxi Bay between Biloxi and Ocean Springs, and the other over the Tombigbee River at Aberdeen.

Missouri

The tentative road plan for 1930 for Missouri will probably include 840 miles of grading at a cost of $12,600,000. 457 miles of paving at a cost of $12,796,000 and 486 miles of graveling at a cost of $4,600,000. In addition 24 miles of grading, costing approximately $360,000, will be carried over on 1929 contracts.

Montana

It is expected that Montana will grade about 450 miles of Federal Aid roads at a cost of approximately $3,500,000. In addition county road and bridge funds will probably contribute about $4,000,000 to include Montana highways. The state will probably also do about 250 miles of reconstruction at a cost of $800,000 on Federal Aid roads and 30 miles of reconstruction at a cost of $15,000 on state road. The work on the new roads will probably involve about 7,000,000 cubic yards of excavation, about 25 per cent of which is suitable for shovel operation. In addition to the above there is about 2,000,000 cubic yards of excavation, costing about $500,000, to be carried over on old contracts. It is also expected that about 340 miles will be graveled at an expenditure of $1,000,000 in addition to the new grading above. Montana's budget for 1930 is not yet completed and the above figures are therefore approximate.

Nebraska

500 miles of new roads will be graded in Nebraska at an expenditure of $900,000 during 1930 according to present estimates. Of this about 250 miles will be Federal Aid road on which work will cost $600,000 while the other 250 miles of State road will require $300,000. It is impossible to estimate additional work which will probably be done on county and local roads. Reconstruction is expected to improve 125 miles at a cost of $250,000 on Federal Aid and State roads. It is probable that about 5,000,000 cubic yards of excavation will be involved in the new work, while the reconstruction will require about 1,000,000 cubic yards of excavation. In addition there is 1,000,000 cubic yards of grading to cost approximately $200,000 to be carried over on old contracts. Nebraska expects to pave 100 miles of highway at a cost of $2,000,000 during 1930 and to gravel 550 miles at a cost of $1,250,000.

Nevada

The 1930 program for Nevada includes 65 miles of new construction at an estimated cost of $400,000 (40 miles Federal Aid costing $324,000, and 25 miles State roads costing $76,000). In addition there will be 166 miles of reconstruction at an estimated cost of $845,500, and an expenditure of approximately $290,400, for oiled gravel, surface mixing method on 171 miles of highway. The reconstruction and oiling mentioned will all be with Federal Aid. The work on new roads is expected to involve 315,000 cubic yards of excavation, and that on reconstruction 166,000 cubic yards, and about 25 per cent of this excavation will be suitable for shovel operation. In addition excavation carried over from 1929 totals approximately 85,000 cubic yards at a probable cost of $24,000. On reconstruction the excavation is the small item, as the replacement of crushed rock or crushed gravel surface takes up most of the cost. Nevada does not contemplate any hard surfacing for 1930 other than the oiling mentioned.

New Hampshire

This state contemplates 175 miles of grading for new roads during 1930, including all types of work. About 50 miles of road will be reconstructed at a cost of $2,000,000. Excavation on new roads will probably total about 798,000 cubic yards, including excavation of borrow and ledge. The reconstruction will involve 460,500 cubic yards figured on the same basis. About 75 per cent of this work will be suitable for shovel excavation. There will be practically no work carried over from the 1929 program which has been almost entirely completed. Hard surfacing on trunk line reconstruction is estimated at fifty miles at a cost of $2,000,000; on State Aid roads 75 miles costing $1,500,000, and on trunk line construction 50 miles costing $1,250,000.

Nolan Brothers of Minneapolis starting new cut with elevating grader outfit on section of their 165,000-yard job on Minnesota State Highway 20, United States 55, between Marion and Chatfield.

New Jersey

The State Highway Commission of New Jersey has not yet adopted a program for 1930. There will, however, be available for new work, which will include rights-of-way, grading, paving, bridges and viaducts, between $25,000,000 and $30,000,000, and it is quite likely that there will be some heavy grading jobs in this. It is estimated that perhaps $5,000,000 will more than cover the cost of grading. These figures apply to state highways only, and we are unable to make any forecast as to what counties and municipalities propose doing.

New Mexico

Two and one-half million dollars represents approximately the expenditure of New Mexico for highway construction during 1929. This coming year's program will probably involve spending $3,300,000.

In Guilford County we find these North Carolina road builders using the double spot system to speed up loading trucks from this Bucyrus-Erie B-2 steam shovel.

New York

Although New York's 1930 highway program is not sufficiently decided upon to permit publication, every indication points towards a considerable increase over the $40,000,000 program for 1929. The American Road Builder's Association estimates a 1930 expenditure for this state's highway construction of approximately $62,000,000.

North Carolina

North Carolina will have available approximately $6,000,000 for new construction, and about $5,000,000 for maintenance and betterments. The State Highway Commission contemplates building approximately 125 miles of paved highways, and the program will also include two large bridges, one to be built over Pasquotank River at Elizabeth City, and the second largest structure will be over the Roanoke River at Weldon and will cost approximately $250,000. The one over the Pasquotank River will cost approximately $350,000. The 1929 Legislature authorized an additional 1543 miles to be added to the State System during the succeeding two years. Approximately 1200 miles of the above amount has been added to the System and taken over for maintenance, bringing the total mileage on the State System up to 9400 miles.

North Dakota

It is estimated that North Dakota will build during 1930 430 miles of new Federal Aid grade at an expenditure of $1,720,000. 19 miles will be reconstruction at an expenditure of $133,000 in addition. Excavation for the new grading is estimated at 4,300,000 cubic yards, while reconstruction will involve about 285,000 cubic yards of excavation. Approximately $2,000,000 of North Dakota's work has already been let, as in this state it is planned to let the work the fall before it is built. No paving is contemplated, but about 450 miles will be graveled at a cost of $720,000.

Ohio

While a detailed report on Ohio's road and bridge program for next year is not available it is estimated that the various types of road work planned for 1930 involve an expenditure of $22,000,000.

Oklahoma

The State Highway Commission at Oklahoma City estimates that Oklahoma will grade about 420 miles of new road during 1930 at a cost of $2,500,000 (200 miles Federal Aid at a cost of $1,200,000 and 220 miles of State Road at a cost of $1,300,000). There will also be reconstructed 50 miles of State Road costing about $150,000. Excavation for this work will total about 8,000 cubic yards of earth and 2000 cubic yards of rock on the new road, and about 20 per cent of this total will be suitable for shovel operation. In addition about a million cubic yards of excavation on highways is being carried over on old contracts, involving an expenditure of about $450,000. Oklahoma contemplated paving about 350 miles at a cost of $7,750,000 during 1930, and there will be about fifty miles of light gravel at a cost of $100,000.

Oregon

Oregon will expend during 1930 about seven million dollars for construction and reconstruction work on State highways. Counties will expend four to five million more on county highways.

Pennsylvania

$4,000,000 is the estimated expenditure for grading 400 miles of new road in Pennsylvania, in addition to which about 75 miles will be reconstructed at a cost of $750,000. Excavation involved will run about 4,000,000 cubic yards for new roads and 800,000 for reconstruction, about 90 per cent of which will be suitable for shovel operation. To this may be added 7,000,000 cubic yards of highway excavation which is being carried over on old contracts, and which will add $6,500,000 to the expenditure for better Pennsylvania highways. It is also planned to pave 1300 miles in Pennsylvania during 1930 at a total cost of approximately $30,000,000.

Rhode Island

1930 grading for new roads in Rhode Island is estimated at 25 miles at a cost of $230,000, $200,000 for 20 miles of Federal Aid roads, $30,000 for 5 miles of State roads. Reconstruction of 15 miles will probably cost $70,000 additional. About 95 per cent of the excavation involved will be suitable for shovel work. Rhode Island is also expecting to do 40 miles of paving at a cost of about $2,500,000.

South Carolina

The State Highway Department of South Carolina is planning construction of 1000 miles of grading and earth type surfacing for 1930 at an expenditure of about $4,000,000. About 250 miles of this, costing $1,000,000, will be Federal Aid, and 750 miles, costing $3,000,000, will be State roads. There is no data available on the local road program nor on reconstruction. It is estimated that the above will involve about 9,000,000 cubic yards of excavation, about 15 per cent of which will be suitable for shovel operation. In addition to the above, 500,000 cubic yards of excavation, involving an expenditure of about $150,000, will be carried over from previous contracts. South Carolina plans to pave during 1930 about 500 miles at an approximate cost of $14,000,000, and to gravel, sand-clay and top-soil another 500 miles at a cost of $4,000,000.

South Dakota

Total grading of new roads in South Dakota for 1930 is estimated at 200 miles, which will probably cost approximately $1,000,000. Of this about 160 miles, costing $850,000, will be Federal Aid work and about 40 miles, costing $150,000, on county roads. Approximately one-half of this work will be reconstruction. It is estimated that the new road work will involve excavation of about 10,000 cubic yards per mile, and the reconstruction about 8,000 cubic yards per mile. In addition to the above 1,000,000 cubic yards of road work costing $400,000 is carried over from previous contracts. South Dakota plans on paving 30 miles at a cost of $900,000, and graveling 250 miles at a cost of $375,000.

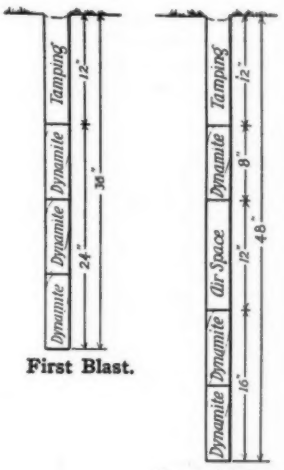
Tennessee

A well-balanced program in Tennessee is on the basis of three years' construction. Highway construction on grading and drainage and surfacing during the past year ran about $16,200,000 and $20,000,000 expenditure is planned for this item in 1930 and also in 1931. Bridge construction for 1929 totaled $8,400,000, and for 1930 it is budgeted at $8,300,000, while for 1931 the amount of the expenditure is planned at $3,000,000. Maintenance of existing highways was figured at $7,200,000 for the past year, and is planned at $7,400,000

(Continued on Page 50.)

FIELD NOTES

How to Save Dynamite in Ditch Blasting



The diagram of the loading for the first blast shows the usual method of placing all the sticks at the bottom of the hole, while the diagram of the charging of the hole for the second blast by "air-spaced" method indicates the positions of the sticks with an air space between them, whereby a ditch of larger dimension is obtained by using the same amount of dynamite.

There has recently been developed a new method of blasting ditches, which it is claimed gives unusual results at reduced costs for materials and labor. This so-called air-spaced, or "relief method" as it is sometimes called, was evolved by A. J. McAdams and Alfred Mathewson of the du Pont Company.

The essential difference between the "spaced method" and the usual practice in ditch blasting is that, while it has been the custom to place all the cartridges at the bottom of the hole, one on top of the other, under the new method an air space is allowed between the bottom charges and a cartridge placed at a specific depth from the surface.

In a typical case of the use of the air-spaced method, Mr. McAdams placed three sticks in the bottom of each hole of a series, leaving a 12-inch space between the top of the uppermost of the bottom cartridges, and one more stick placed with its top a foot below the surface. The top stick was tamped to the surface level. The ditch blown was five and a half to six feet deep and aproximately 16 feet wide at the top. This was done in "made" soil, but Mr. McAdams says: "The same results should follow in heavier types of soil."

Comparative tests were made of ditching according to more or less standardized practice, i. e., placing all the cartridges at the bottom of the hole; and the air-spaced method separating one stick by a space of 12 inches. Measurements made at eight points along a 45-foot section of the ditch blasted in the usual way showed an average depth of three feet. Eight measurements of 42 feet of ditch blown by the air-spaced method averaged 4.1 feet in depth. The character of the soil and the water content and other conditions were identical in both cases. Yet, with the same quantity and type of explosives in each instance, the air-spaced method made a ditch one-third deeper than was obtained by following old method.

While for deeper and narrower ditches, the amount of explosives and the depth of the loading varies according to condition, the air-spaced principle is the important factor in securing the desired results.

Accidents in Quarrying Industry Reduced During 1928

A total of 119 employees were killed and 10,568 injured in the quarrying industry of the United States during the calendar year 1928, according to a statistical survey made by the United States Bureau of Mines, Department of Commerce, which has recently been released. The death rate for the industry was reduced 10% and the injury rate 20% below the 1927 level, when 135 workers were killed and 13,459 injured.

In the quarrying industry 1,436 active operators employed 89,667 men; this number being 1,850 less than the preceding year. These men performed a total of 24,397,377 man-days of labor for which the fatality rate per thousand 300-day workers was 1.46, while the injury rate was 129.95. The accompanying chart lists the record of fatalities and injuries together with the percentage rates.

Type of Quarry	No. of Fatalities	Fatality Rate per Thousand 300-day Workers	No. of Injuries	Injury Rate per Thousand 300-day Workers
Limestone	60	1.84	5,399	166.02
Cement Rock....	25	1.05	1,161	48.76
Granite	11	1.17	1,713	181.48
Marble	7	1.08	718	110.38
Trap Rock.....	9	3.13	591	205.78
Sandstone and Bluestone	3	1.02	473	160.50
Slate	4	1.24	513	158.87

Of the 119 deaths in the entire industry, 77 occurred in the quarries and 42 outside, while 6,297 injuries occurred in the quarries and 4,271 on the outside.

The greatest single cause of deaths in and about the quarries was falls or slides of rock or overburden, which accounted for 29 fatalities. Falls of persons caused 11 fatalities; machinery 10; explosives 9; haulage 8; electricity 3; handling rock at face 2; flying objects 2; drilling and channeling 2; and boiler and airtank explosions 1. The largest single cause of all classes of injuries in and about quarries was handling rock at the face, which accounted for 1,400 accidents. In outside work, machinery was responsible for 9 fatal injuries, haulage and falls of persons for 8 each; burns for 6; electricity for 4; falling objects for 3; flying objects for 1, and other causes for 3.

The largest number of persons employed in the quarrying industry in any State was in Pennsylvania, with 15,291 workers. Ohio with 6,610, Indiana with 5,311, California with 4,896, New York with 4,590 and Vermont with 4,463 workers followed in order. The largest number of deaths, 19, and injuries, 1,520, occurred in Pennsylvania.

No Question About It

"Henry wanted to spend his vacation in the country and his wife wanted to go to the seashore."

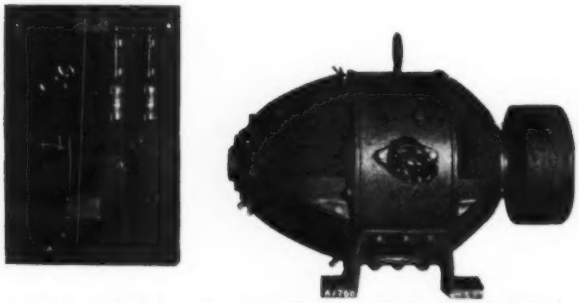
"How did they settle it?"

"It is evident that you are not married."

EQUIPMENT YOU OUGHT TO KNOW ABOUT

Light Plant for Diesel Machines

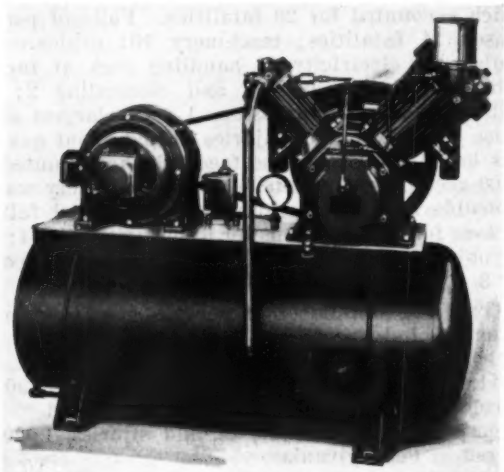
A new belt-driven generator for use as an electric light plant on Diesel-driven machines has been developed by the *Bucyrus-Erie Company, Specialty Department, South Milwaukee, Wisconsin.* Voltage is maintained within a maximum variation of 5 per cent under a speed variation of from 900 to 1,800 r.p.m. This light plant generator has been thoroughly tested over a wide range of speed. It is very rugged in construction and there are no delicate adjustments to get out of order.



Where lights are not required when the engine is not running, this generator, shown above, together with control board, will prove ideal equipment. For further information write *Bucyrus-Erie Company, Specialty Department,* mentioning this magazine.

New Ingersoll-Rand Compressor

Ingersoll-Rand Company, 11 Broadway, New York, N. Y., announces a new line of air-cooled, two-stage air compressors, known as the Type 30. It is built in four sizes: ¾, 1½, 3, and 5 horse power; each for a



working pressure up to 200 pounds continuous duty.

Among the features of this new unit are the unloading system, which is simplicity itself, the efficient air-cooling method with circulating air driven directly on the cooling coils, the adjustable V-belt drive, the lubricating system on which there is nothing to wear or get out of order, the ball-bearing mounted shaft, and the valves which will give satisfactory service over an indefinite period. An interesting bulletin on this new line of compressors may be had by writing to the manufacturers.

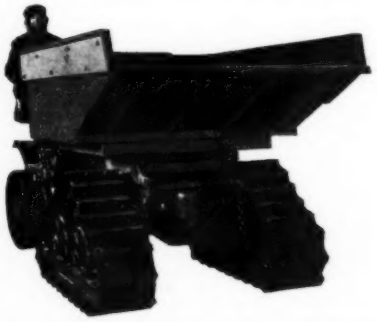
Electric Cab Heater

For use on electric shovels and draglines, a new electric cab heater, consisting of a heating element which is wholly enclosed so that the operator cannot come into direct contact with it, has been announced by the *Bucyrus-Erie Company, Specialty Department, South Milwaukee, Wisconsin.* As ideal for offering much to the comfort of the operator during the winter wonths, these heaters are made for 220 and 440 volts, and may also be obtained for other voltages. The largest size is 6 kw, the smaller, 2 kw and 3 kw.

This new heater is controlled by an enclosed safety switch, mounted separately. Write to the *Bucyrus-Erie Company, Specialty Department,* for further information.

Hughes-Keenan Company Exhibits at Road Show

The Hughes-Keenan Company's 1930 Road Show exhibit will feature some new and interesting equipment, showing for the first time the uniquely designed mechanical power hoist for Ford and Chevrolet trucks. This efficient unit, which is built to sell at a remarkably low price, will be shown combined with a Hughes-Keenan Dump Body of 1-yard capacity. In the Chevrolet Motor Company booth, a Hughes-Keenan 1½-yard Gravity Dump Body mounted on the Chevrolet truck will be exhibited. Other exhibits will be a 4-yard "Iron Mule" and a Roustabout Crane, both mounted on the McCormick-Deering Tractor, Model 20, and a quick-acting hand hoist dump designed especially for Ford trucks.



In addition to these units the Hughes-Keenan Company will show a 2-yard "Iron Mule" and a Roustabout Crane mounted on the United Tractor. These two pieces of equipment will be shown in the United Tractor and Equipment Corporation's booth.

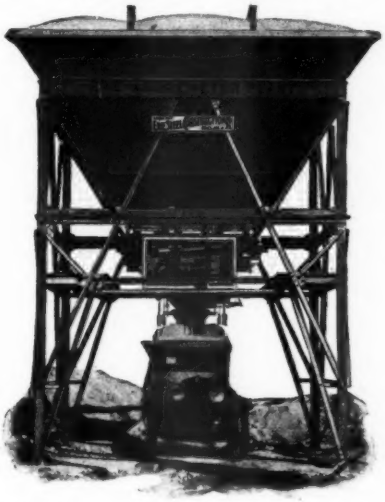
As has been mentioned previously, "Iron Mules" are 2 and 4-yard dump bodies mounted on United and McCormick-Deering Tractors. This combination makes a dirt mover that has the combined advantages of a tractor and truck without the disadvantages of either. The 2-yard "Iron Mule" is gravity dump and equipped with specially built heavy-duty French & Hecht wheels.

New Portable AggreMeter Plant

A new type of AggreMeter plant for loading the various types of mixer trucks — such as the Highway Truck Mixer, Paris Transit, Barrymore, Clinton, True Batch, and others — is now made by the *Erie Steel Construction Company, Erie, Pennsylvania.*

These new plants are built in two, three or more compartments of 25 tons capacity and up, for loading one-half to three-cubic-yard trucks. The design of the entire unit is simple. Briefly, it consists of a self-cleaning bin, a self-cleaning accurate weighing AggreMeter, and a floating charging hopper. Every ounce of material within the AggreMeter and charging hopper is active and enters the truck in a premixed condition.

It is easy to obtain accurate weight to within one pound with this AggreMeter, thus assuring uniform batches. One operator can weigh and load a batch



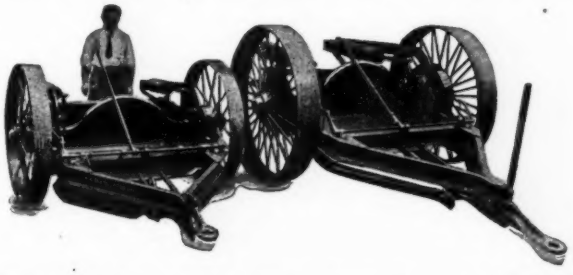
of sand and stone in from twenty to thirty seconds. Each material is weighed on a separate beam, and an auxiliary dial shows the approach to the desired weight. Hand wheels control the operation of the bin gates; a trip rope opens the draw-off door which closes automatically.

The Erie Steel Construction Company will exhibit at the Road Show one of the new ¾-cubic-yard Multi-Power Clamshell Buckets which has never been displayed before. The exhibit will also include one of the Erie "Peerless" buckets, as well as the New Type "G" two-piece AggreMeter plant and a Combination Volume-Weighing AggreMeter. For further information on these Erie products, write the *Erie Steel Construction Company, Erie, Pennsylvania,* mentioning *The Excavating Engineer.*

New Two-Yard Wheeled "Warco" Scoop

The W. A. Riddell Company, Bucyrus, Ohio, announce the development of a new giant wheeled scoop. Carried by wheels 66 inches in diameter with 10-inch rims, the heavy bowl or pan is supported upon a full length one-piece nickel steel axle which is arched high in the center to afford maximum loading space. The wheels are Timken bearing mounted and are equipped with clutch housings which contain clutches of the progressive internal expanding band type — exclusive "Warco" features, according to the manufacturers.

These new model "T" 2-yard capacity scoops are operated in the same manner as the smaller one-yard scoops. A lever and a latch are the only controlling mediums necessary. With the latch in place a slight pull on lever hand line actuates the clutch, and by the tractional force of the wheels causes the bowl to be lowered into cutting or loading position, where it is held at the desired depth by a slight tension on lever rope. By releasing the tension of the lever the bowl automatically swings into raised position so that the load rides high and free. In raised position an end gate automatically closes the front of the bowl. In order to dump, the latch is raised by means of a hand



line, and the clutch control lever is again pulled, causing the clutch to engage in lifting the bowl into dumping position.

These scoops may be operated in trains of two or more, depending entirely upon the tractor's power. The ordinary 10-ton type tractor will operate three 2-yard scoops without difficulty, all of which may be controlled from a loading platform on the leading scoop through hand lines by a single man. Further information may be obtained by writing the manufacturers. Please mention *The Excavating Engineer* when writing.

New Chrome Vanadium Wrench Set

The Bonney Forge and Tool Works of Allentown, Pennsylvania, recently announced the addition of two new wrench sets to their line. These sets, shown in the accompanying illustration, are broached with double hexagon openings, making it possible to remove nuts or bolts even though obstructions will only permit a one-twelfth turn at a "bite." Set No. 29 consists of the three most popular short type Double Hexagon Box Wrenches, for the six most commonly used nuts and bolts. Set No. 31 consists of six Double Hexagon, Double End Box Wrenches which are the twelve most frequently used sizes. In writing to the Bonney Forge and Tool Works for further information please mention *The Excavating Engineer.*

Bucyrus-Erie Records Forward Steps of 1929

One yardstick for the measurement of a company's leadership in any field is the forward steps it takes for the benefit of that field. Volume of sales alone is not an index of the service performed; new developments, improvements and research must be considered to get a true picture of a company's activity. Research, study and investigation must always precede new developments and improvements of product.

Looking back over the year of 1929 Bucyrus-Erie selects the following as among its outstanding achievements for the year:

Diesel + Air 1-Yard Shovel

The introduction of a 1-yard Diesel shovel having three independent engines — one for each motion. This Diesel shovel-crane-dragline has the same high-speed digging features as the well-known Gas + Air, with the added advantage of the tremendous lugging power and great fuel economy of the Atlas-Bucyrus-Erie Diesel engine. This shovel derives power for the hoist directly from the Diesel engine, and power for the thrust and swing from air engines, the compressed air for which is stored while the power from the main engine is not required for hoisting.

The 1020, ½-Yard Gasoline, Diesel or Electric Shovel-Crane-Dragline-Clamshell

This machine, the smallest of the Bucyrus-Erie family, was introduced during 1929, and first shown at the 1929 Road Show. The machine lives up to the Bucyrus-Erie reputation for simple, rugged construction, easy convertibility and extreme accessibility. Like its companion machine, the 1030, ¾-yard machine, it has all shafts above deck equipped with ball-bearings. Convertibility from one to the other of the

Bucyrus-Erie 1020 gasoline shovel with rope crowd.

following types is easily and quickly accomplished — shovel, dragline, crane, clamshell and drag shovel. Its high-speed cycle and ease of control make it a big producer, and the sturdy motor which forms its power plant delivers ample power for all kinds of digging.

1030 Diesel

In 1928 the Bucyrus-Erie 1030, ¾-yard gasoline shovel was introduced. In 1929 the machine is also offered with Diesel drive, thus combining the rugged simplicity, fast cycle and ease of operation with a fuel cost that is astoundingly low compared with steam or gasoline. The machine is remarkable in that it only uses from one-half to one-third the amount of fuel required by a gasoline machine, and this fuel costs only one-third to one-fourth as much per gallon as gasoline. This means that the fuel cost of a 1030 runs from seventy-five to ninety per cent less than the fuel cost of a gasoline machine of the same size.

Railway Maintenance Shovel, Crane

To meet the demand of railroad maintenance work for a universal maintenance machine of ¾-yard capacity, Bucyrus-Erie has introduced a caterpillar-type mounted machine especially designed for rail-

Bucyrus-Erie Type 2030 gasoline-driven maintenance-of-way machine equipped as a shovel, owned by Pennsylvania Railroad Company.

road work, which can be equipped as either shovel, dragline, clamshell or crane (with hook or electric lifting magnet) and is designed to be transported on a railroad car (the width of the caterpillar being such that it can be run into an end dump gondola car for work train service).

The First 16-Yard Stripping Shovel

With a dipper capacity larger than any other dry land excavator, the new 16-yard combination of the Bucyrus-Erie 750-B makes that machine the largest output capacity stripping shovel ever built. This machine has produced almost 500,000 cubic yards per month. The engineer's estimate of a heaped dipper full is 23 cubic yards.

Electric Tower Excavator

For the building of levees along the Mississippi, Bucyrus-Erie has modified a machine which was first introduced many years ago for the Mississippi River Valley protection — the tower excavator. On this huge machine is a 10-yard bucket, handled from two machinery units known as head tower and tail tower. Since the towers are separated by several hundred feet, the machine is enabled to make a wide, shallow borrow pit with a pre-determined grade, and to deposit its material in the levee in such a manner as to make a minimum amount of regrading necessary.

Bank Grader for Flood Protection Work

Grading a bank or levee to a predetermined slope is accomplished quickly and cheaply with the new Bucyrus-Erie bank grader which was introduced during 1929 for use on the Mississippi River. This is only one of the machines Bucyrus-Erie has developed especially for this river flood control work, in which it has been active over a period of some fifteen years.

SHOTS FROM THE FIRING LINE

A. G. C. to Convene in New Orleans

The Associated General Contractors of America will hold their Eleventh Annual Convention in New Orleans, Louisiana, the week beginning January 19, 1930.

This, undoubtedly, will be the largest gathering of contractors and constructors during the year. Many construction men from every state of the union will avail themselves of the mild weather existing there at that time of the year and will come to New Orleans for this convention.

It is the policy of the National Officers of the Associated General Contractors of America to exclude all exhibits from their convention. This is due to the fact that such exhibits conflict with other well-established exhibits of national importance.

Canada

Manitoba Notes

Contracts for approximately forty-five miles of grading have been awarded by the **Provincial Department of Highways, Winnipeg, Manitoba,** to the following Winnipeg contractors: Middlewest Construction Company, 15 miles; G. B. Woods Company, 10 miles; J. N. Pitts and C. Flint, 20 miles.

Ontario Notes

Hon. Charles Stewart, Minister of the Interior, Ottawa, Ontario, has announced that the **completion of the remaining link in the Trans-Canada highway** will be undertaken in the near future under direction of the Federal and Dominion Governments. The Department of the Interior, Ottawa, Ontario, will have charge of construction of some 85 miles between Donald and Canoe River, while the British Columbia Government will take care of construction work of some 76 miles west of Canoe River. Work will probably be completed in 1933. The sum of $750,000 has been set by the Federal Government for the project which when completed will provide an all-Canadian route to Vancouver, British Columbia.

Quebec Notes

The Department of Highways, Quebec, has awarded **contract to St. George Cartage and Construction Company, Ltd.,** Montreal, for widening and paving the Soulanges Canal Road Highway No. 2, near Montreal. Cost of work will be $232,000. Length of road involved 13.3 miles. Type of pavement not specified.

New England Notes

BY J. C. ALEXANDER

Road work has shut down for the winter in New England. Very few new grading projects have been let by the State Highway Department so that road construction is at a standstill.

Vermont, New Hampshire and Maine have **even greater road construction projects in view** than those completed this year. Their trunk line routes are rapidly being hard surfaced so that year-round travel will soon be possible. In this work the following companies have been particularly prominent: P. J. Holland, Lawrence, Massachusetts; B. Perini & Sons, Ashland, Massachusetts; Carlo Bianchi, Framingham, Massachusetts; D. W. Overocker, Brattleboro, Vermont; Amos D. Bridges' Sons, Hazardville, Connecticut; Lane Construction Corporation, Meriden, Connecticut; Arborio Road Construction Company, Hartford, Connecticut; Joseph McCormick, East Providence, Rhode Island; State Construction Company, Boston, Massachusetts; A. Susi & Company, Boston, Massachusetts; and Callan Construction Company, Bristol, Rhode Island.

George F. Quentin has finished work for Cenedella & Company at Perry, Maine.

R. E. Cunniff is leaving for Florida shortly. He reports a very successful season.

On one of their recent jobs **Greaney & Sherry wanted to use a crane with an unusually long reach.** They had a Bucyrus-Erie B-2 shovel-crane equipped with a 40-foot boom but this did not anywhere near reach the required height. To solve the difficulty they spliced a pole to the end of the crane boom, thereby adding 32 feet to its length, giving them a 72-foot boom. Tackle was rigged as shown in the illustration, and the device functioned in a satisfactory manner. Of course, the lifts required for this extra long extension were not unusually heavy ones.

Since this work was done this B-2 has been taken over by the Sherry Construction Company of Fall River, Massachusetts.

The annual banquet of the New England Road Builders' Association was a tremendous success. Everybody connected with road work in New England was there and "a great time was had by all."

New England attendance at the Road Show will be very high this year due to its being held in the east.

Charles Arrigoni and Chelso Arrigoni, of Middletown, Connecticut, sail January fourth for a trip to the various countries of Europe.

P. McGinnis of Jamaica Plain, Massachusetts, reports having had a very enjoyable trip to Bermuda.

Eastern Notes

BY W. R. BEEBE

Robert M. Rogers, operator for the District Foundation Company, Inc., of Washington, D. C., sends us the accompanying pictures, showing a large dwelling house which was wrecked by the Bucyrus-Erie steam shovel he operates, in making way for a $300,000 apartment house to be located at 3620 16th Street, N. W., Washington, D. C. 9000 cubic yards of excavation was required and

SHOTS FROM THE FIRING LINE — Continued

the work was finished on November 29th. The large cedar tree shown was transplanted by the 20-B to the lawn of the Martha Washington Seminary which adjoins the apartment house site. The tree was moved by Mr. Rogers and his Bucyrus-Erie from the apartment house site to the Seminary grounds without injury to either shovel or tree.

Harry W. Manz is operating a Gas + Air for the Cushing Stone Company of Schenectady, New York. He writes that the Gas + Air is doing fine, and that he is putting out one hundred loads in five hours.

Buffalo and Vicinity

BY D. E. WHITE

Bero Brothers Engineering and Construction Company have completed their State Highway job going out of Gowanda, New York, and are now doing a small job at Woodlawn, New York. The accompanying illustrations show Syl Falk and Tom Lynch, engineer and oiler, respectively, also the storage pile which is about cleaned up, just before moving out for Woodlawn.

Robert E. Tompkins, Rochester, New York, now has his Bucyrus-Erie 1030 shovel at work at Westernville, New York, on a bridge job on the Mohawk River just at the head of Delta Lake. Mr. Tomkins is spending a great deal of time on the job himself, while "Kid" Dewey is at the levers. Mr. Tompkins cannot say too much for his 1030 machine and has had a very successful year.

John Adrian, Williamsville, New York, has been using his Gas + Air and Type B-2 Bucyrus-Erie machines on a creek channel change, consisting of rock excavation, and has made wonderful progress on this project. We wish to congratulate John on the increase in his family, as he is the proud father of a fine baby girl.

Rossow Brothers, Buffalo, New York, have had a very busy season, and have managed to keep both of their Bucyrus-Erie Gas + Air machines at work all season. As yet we do not know the weight of the buck that Max got during the hunting season, in fact, we have not even tasted it, but Charley is in hopes of having enough meat for his dog for the rest of the winter.

A number of New York State contractors were successful bidders at the letting of December 6th, when some large jobs were awarded. Here are the names of the low bidders: I. V. A. Huie, Saugerties; Joseph M. Murray, Rochester; H. W. Golden & Son, Troy; Cold Spring Construction Co., Akron; John Irwin Contracting Co., Lockport; John Thompson, Carthage; Charles E. Malone, Port Henry; G. D'Angelo, Binghamton; John Bellardino, Seneca Falls.

Pittsburgh and Vicinity

BY J. S. WEAVER

A Pittsburgher made one of the principal addresses at the fourth annual convention of the **National Paving Brick Manufacturer's Association** in Chicago early in December. The speaker was **Edward L. Schmidt,** Chief Engineer in the Bureau of Roads of Allegheny County. Other Pittsburghers in the party were Norman F. Brown, director of the county works department; P. J. Freeman, Chief Engineer of the Bureau of Tests; Norman Able, Engineer of Design in the County Road Bureau; E. A. Griffith, Engineer of construction of the County Road Bureau; Director Edward G. Lang, and Charles M. Reppert, Chief Engineer of the City of Pittsburgh Department of Public Works.

John Van Briggle is operating a Type "B-2" Bucyrus-Erie shovel for the W. J. Hasley Company in Pittsburgh.

W. J. Hasley of the W. J. Hasley Company reports signed contracts that will keep his two Type "B-2" Bucyrus-Erie shovels in operation for the next ten months.

The Rankin Construction Company, Uniontown, Pennsylvania, have made very good progress on their State Highway work in Cambria County. Type "GA-2" Bucyrus-Erie shovels are used on this work.

Harold Allen is operating a Type "GA-2" Bucyrus-Erie for the Rankin Construction Company at Frugality, Pennsylvania.

Hector Moran is operating a Bucyrus-Erie Type "GA-2" for the Navarro Company on the new Allegheny General Hospital. This was one of the largest basement excavation contracts ever let in the City of Pittsburgh.

The Pennsylvania Highway Department expect to build 1300 miles of highway in 1930. It will be the largest construction program ever scheduled by any State in the Union, it will be twice as much as Pennsylvania has ever attempted in any one year. The Pennsylvania State Highway Department has answered President Hoover's call one hundred per cent.

Samuel Domenick, Altoona, Pennsylvania, was awarded 4.04 miles of State Highway work in Lycoming County, Pennsylvania.

The State Construction Company of New Kensington, Pennsylvania, was awarded a contract for the construction of 4.76 miles of State Highway in Clarion County, Pennsylvania. Bucyrus-Erie Gas + Air and steam shovels will be used exclusively on this work.

Bids were opened a few days ago by the Pennsylvania State Highway Department for 16 projects involving construction of 40.3 miles of highway construction. Projects and low bidders for Western Pennsylvania are as follows: Clarion, Pennsylvania, 11,737 feet grading and drainage to R. C. McQuiston, Mercer, Pennsylvania; Clarion, Pennsylvania; 23,163 feet to H. N. McNutt, Clarion, Pennsylvania; Jefferson, 20,689 feet to A. R. Cooper, Idamar, Pennsylvania.

Edward H. Canon, Pittsburgh, was awarded a contract for 2.92 miles of State Highway in Westmoreland County.

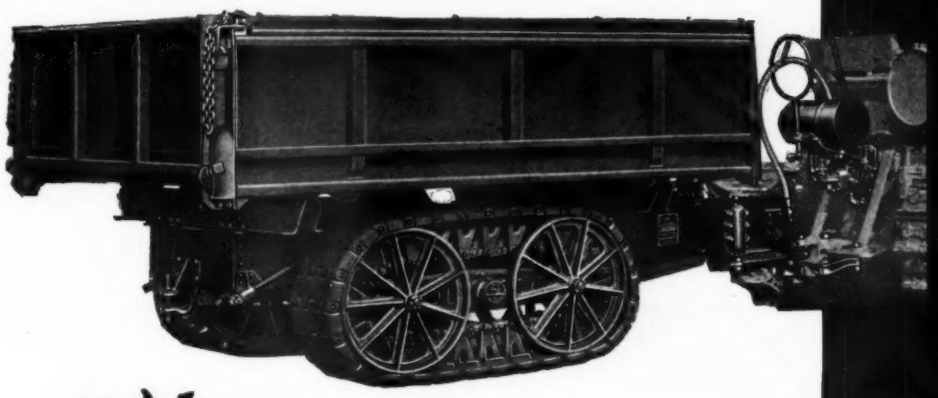
The McDonald Construction Company have their excavating contract for the addition to the Taylor Alderdice School in Pittsburgh. A Type "B-2" Bucyrus-Erie operated by **Lewis Smith** is used on this work.

Contract for the construction of a branch line and yard near Canton, Ohio, has been let by the Pennsylvania Railroad Company to **T. J. Foley Company,** Pittsburgh, Pennsylvania. The improvement calls for a branch line one mile long, connecting with the Pennsylvania's main line at Ivydale Avenue and running south to the new plant of the Timken Roller Bearing Company. About 108,000 cubic yards of earth will be moved.

Not a Mind Reader

Mis: "Is my face dirty, or is it my imagination?"

Take: "Your face isn't; I don't know about your imagination."



Why Atheys are revolutionizing dirt moving costs - - - -

Dumps to Right Left and Rear

See Atheys at the Road Show!

Check the practical Athey operations against an actual job. You'll find that Athey's ability to dump to the right, left or rear, fits it for ANY job that you may have. To every job it brings the same economies, the same speed and versatility. With one piece of equipment you solve all your dirt-moving problems and cut your costs at the same time. These advantages are not theoretical but ACTUAL — demonstrated for years on the jobs that have been made easy by Athey!

1. It dumps to the right, left or rear — fits any job.
2. One man — Tractor operator controls entire unit.
3. Wide track bands permit continuous day and night operation, rain or shine. They uniformly pack fill.
4. Tractor and trailer can turn without backing in 20 to 25-foot fill.
5. Wide body facilitates quick spotting of dipper. Eliminates 75% of shovel delays.
6. Light running, assuring considerable savings in gasoline.
7. Made in two capacities, 4-5 yards and 7-8 yards.

Add these advantages together and you have a unit that is really revolutionizing the dirt-moving industry. Do these economies interest you? Then write for full information.

ATHEY TRUSS WHEEL CO.

130 N. Wells St., Chicago, U. S. A.
Cable Address: "Trusswheel", Chicago
The Baldwin Locomotive Works, Foreign Representatives, Philadelphia, Pa.

ATHEY TRUSS WHEEL WAGON

IT BRIDGES THE SOFT SPOTS

In writing to Athey Truss Wheel Co. please use post card bound in the center of this number.

SHOTS FROM THE FIRING LINE — Continued

Southern Notes

BY R. S. WELFER AND W. W. WHORLEY

L. D. Smith, who hails from the Florida phosphate district, **has been operating** a Northwest dragline for Murdock & Cliett, near Huntsville, Alabama. His present address is Lacy Springs, Alabama.

Levee construction work along the lower Mississippi is progressing at a satisfactory rate in spite of the recent rainy weather. This work is being handled mainly by long boom draglines, of which there are quite a number between Baton Rouge and New Orleans, Louisiana.

W. C. Ward has been operating a Bucyrus-Erie 50-B steam shovel for Warren Bros. on the Cuban National Highway project. At present Mr. Ward is in the Mississippi A. & M. College taking a course in mechanical engineering.

Winter rains came early in Louisiana and delayed the State paving program considerably.

Craven & Lang are making good progress with the paving of famous old Canal Street in New Orleans, despite rain and Christmas shopping crowds. D. G. Villere is doing the bulk of their grading.

Swinney & Coleman of Tampa, and more recently Alabama, have two draglines at work on the drainage job recently awarded them near Port Allen. They are great boosters for Atlas Imperial Diesel engines on dragline work.

Ziegler Brothers of Greensboro, North Carolina, expect to start soon on their State paving project at Arcadia, La.

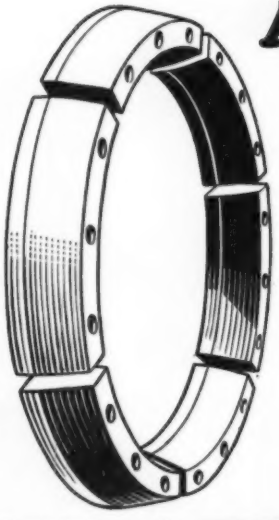
G. C. Lewis from New Hampshire is working with Moore Brothers on a paving contract at Jeanerette, Louisiana.

A number of State paving projects were held up pending the sale of five million dollars worth of bonds. The bonds have just been sold at a good figure, work orders are being issued, and equipment and men recently idle are going to work.

Detroit and Vicinity Notes

The above view shows one of the Bucyrus-Erie shovels in Flint handling a job of light grading on one of the city

Another Big Record!



THE Bowsman Washed Sand and Gravel Company, Piqua, Ohio, installed Asbesgraphite Friction Blocks on a Lidgerwood Hoist in place of wood blocks. After a heavy season they reported as follows:

"After the season closed, we find the Asbesgraphite Blocks have already pulled twice the yardage of the last set of wood blocks, and on close examination show very little wear. We should get not less than two good seasons run or more. Your blocks by their long wearing quality do away with not less than five or six changes of wood blocks."

Eliminate your friction block problems by using Gatke Asbesgraphite Frictions. They are self-lubricated, non-scoring, non-grabbing.

Write for prices, today!

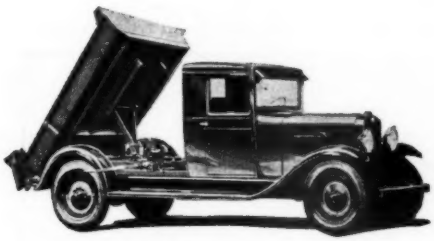
Manufactured by THOMAS L. GATKE, Room 2142, 228 N. La Salle St., Chicago, Ill.

GATKE-ASBESGRAPHITE
BRAKE BLOCKS AND FRICTIONS
CARRIED IN STOCK FOR ALL INDUSTRIAL EQUIPMENT

In writing to Thomas L. Gatke please use post card bound in the center of this number.

See HUGHES-KEENAN Dirt Movers at the ROAD SHOW

There are many hundreds of "Iron Mules" in use. In fleets from 3 to 60 units.



Rugged, efficient dump bodies for all standard trucks, including the new mechanical power hoist that promises unusual performances at an unusual price.

"IRON MULES"

Two of these tractor dumps will be exhibited at the Road Show at Atlantic City—the 4-yard with crawler tracks and power hoist, and the 2-yard with new spring mounting.

"Iron Mules" won't merely wish you a prosperous New Year. They'll make you one. "Pulling traction" and the fact that the driver is always facing the load are two of the reasons why Hughes-Keenan "Iron Mules" haul bigger daily yardages at less cost than trucks and teams. In any weather or going.

DUMP BODIES

A feature of the exhibit will be the Hughes-Keenan mechanical power hoist, a powerful and efficient hoist of unique design—that will sell for a remarkable price.

This hoist and the "Iron Mules" together with a number of the rugged, efficient Hughes-Keenan Dump Bodies will make an exhibit worth the time of the busiest contractor. The dump bodies will be in 1 and 1½-yard sizes equipped with hand hoist, gravity dump and mechanical power hoist.

See them. Main floor, space 111. Or mail coupon for illustrated folders.

THE HUGHES-KEENAN CO.
MANSFIELD, OHIO

TEAR OUT—MAIL TODAY

13

The Hughes-Keenan Company,
Mansfield, Ohio.
Gentlemen:
Please send without obligation your illustrated "Iron Mule" folder and dump body literature.

Name_____

Address_____

City_____ State_____

HUGHES-KEENAN
IRON MULE
TRADE MARK REG. U.S. PAT. OFF.
TRACTOR DUMP
MOUNTED ON MODERN TRACTORS

In writing to The Hughes-Keenan Co. please use coupon or post card bound in the center of this number.

PERSONAL—
Information leading to the arrest of high digging and handling costs can be obtained from Hayward engineers. Address The Hayward Co., 52-54 Church St., New York, N. Y.
Hayward Buckets

SHOTS FROM THE FIRING LINE — Continued

streets. H. C. McClure, city engineer, who sends us the picture tells us that this machine has worked on 13 different jobs this year; the average length of which was 1750 feet, width 30 feet, and the average depth of cut one and one-half feet. The total yards handled by the shovel to date on these light street cuts is very close to 55,000 cubic yards, the maximum yardage in any one day being 833 yards engineer's measure. Mr. McClure also tells us that the operators are extremely well pleased with the two Bucyrus-Eries which have been used for this work, and calls our attention to the remarkable shape in which they are able to leave the subgrade as shown in the above view.

Chicago and Vicinity

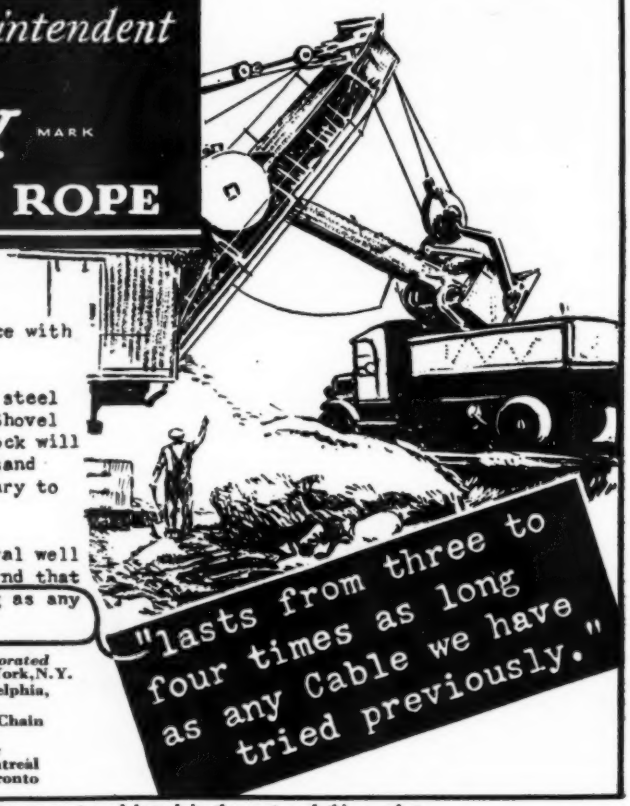
Above is a picture showing excavation for the basement on Chicago and Laramie Avenues, Chicago, handled by **Thomas Madden, Contractor.** At the right a Bucyrus-Erie Gas + Air owned by **B. C. Brautigam** is loading to trucks on the bank, while at the left a Moore shovel is loading into Macks on a dirt ramp. A Caterpillar tractor was used as shown for giving the Macks a lift up the dirt ramp from this lower

Read what this General Superintendent has to say about

TRADE **TRU-LAY** MARK

(REG. U.S. PAT. OFF.)

PREFORMED WIRE ROPE



This is a letter from the general superintendent of one of the largest quarry concerns in this country:

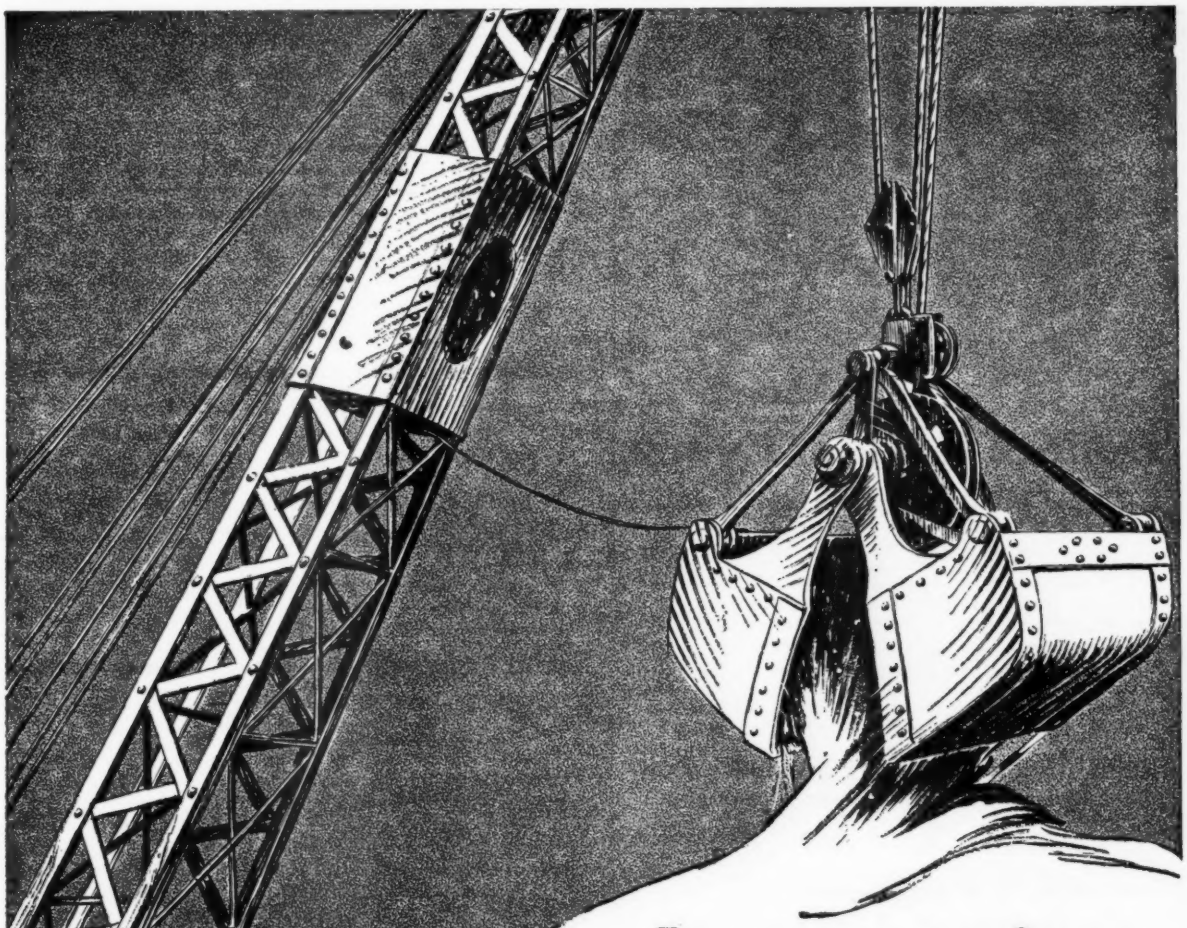
In answer to your inquiry regarding our service with TRU-LAY brand Cable.

We have found that your TRU-LAY improved plow steel lines in service on our "MARION" 37 Electric Shovel handling around 1500 tons per day of quarry rock will give us, barring accident, from 40 to 75 thousand tons of loaded stone before it becomes necessary to renew the Cable.

During the past four years we have tried several well known brands of Cable, and in comparison we find that TRU-LAY lasts from three to four times as long as any Cable we have tried previously.

"lasts from three to four times as long as any Cable we have tried previously."

AMERICAN CABLE COMPANY, *Incorporated*
New York Central Bldg., 230 Park Ave., New York, N. Y.
District Offices: Chicago, Detroit, Philadelphia, Pittsburgh, Tulsa, San Francisco
An Associate Company of the American Chain Company, *Incorporated*
Canadian Licensed Manufacturers:
Dominion Wire Rope Co., *Limited*, Montreal
Canada Wire & Cable Co., *Limited*, Toronto



Builders of the famous B. & B. Aerial Tramways for industrial haulage.

Important!

Which is most important—a reliable excavator, a reliable bucket, or reliable wire rope? As well ask which is the most important leg of a three-legged stool.

Yellow Strand Wire Rope, supreme in strength and elasticity, is a legitimate part (not accessory) of all heavy-duty excavating machinery.

Write for Catalog 51 and name of nearest distributor of B. & B. Ropes.

BRODERICK & BASCOM ROPE CO., St. Louis, Mo.

Eastern Office and Warehouse: 68-70-72 Washington St., New York City
Western Office: Seattle—Factories: St. Louis and Seattle

YELLOW STRAND WIRE ROPE

In writing to Broderick & Bascom Rope Co. please use post card bound in the center of this number. LR782

Boilers to Meet Every Engineering Need

When you have a new job, different and difficult . . . when you must work in a new location under difficult working conditions . . . no matter what the job, we can build a boiler to meet your needs . . . a boiler that will give you power, speed, durability, rugged strength and efficiency.

Johnston Boilers have proven their value on engineering projects the world over. They are built by an organization that has been building good boilers for over 65 years. When you have a boiler problem you may find our experience worth while. Call on us then.

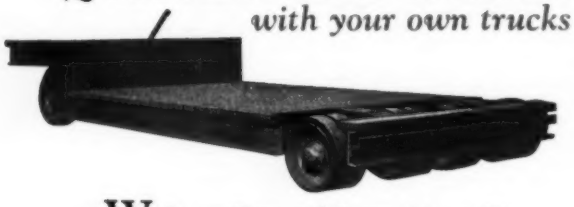
JOHNSTON BROS., INC. FERRYSBURG, MICH.

Specializing in Boilers for Contractors' Equipment

Move your heavy equipment

QUICKLY AND SAFELY

with your own trucks



With trailers of from 20 to 75 tons capacity, equipped with six or more rubber-tired wheels, you can carry your shovels and other heavy equipment quickly and safely from job to job. Save valuable time and save your equipment from expensive and unnecessary wear. These extremely sturdy and well-built units have cast steel wheels, Timken roller bearings and internal expanding brakes.

May we furnish you complete information?

BUCYRUS-ERIE COMPANY

BUCYRUS ERIE

Specialty Department

South Milwaukee, Wisconsin

SHOTS FROM THE FIRING LINE — Continued

level. Another Bucyrus-Erie Gas + Air owned by Murphy Bros. Teaming Company was also used for the excavation of this building.

Mulvill Brothers, well-known contractors of Alton, Illinois, completed their large 1,500,000-cubic-yard excavation project on the new Illinois Terminal extension from Alton to O'Fallon, Illinois. The material consisted mostly of clay, some of which was extremely heavy and offered difficulties in handling. A Bucyrus-Erie Type B-2 handled 500,000 cubic yards of the immense project, on which Western 20-yard automatic air dump cars were used for long hauls and fills. Mulvill Brothers have just completely overhauled their B-2 in preparation for other big jobs of dirt moving.

Leroy Goddard Binkley, prominent in the coal industry of Illinois, died of heart disease at his home in Glencoe, Saturday, November 16. Funeral services were held in Marion, Illinois, on Tuesday, November 19. Mr. Binkley was president of the Binkley Coal Company and also the Pyramid Coal Company. He was a native of Marion, and received his early education there, later graduating from Ohio State University.

Surviving Mr. Binkley are his widow, Mrs. Leroy Binkley, and three children, Ann Elizabeth, 11 years old, and Leroy and Goddard, twins, 9 years old.

St. Louis Notes

BY A. J. KOENIG

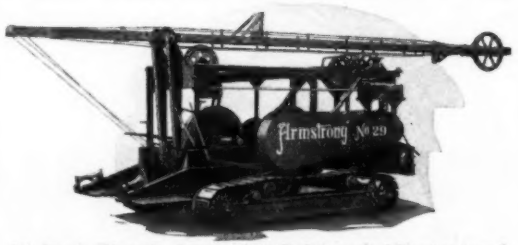
The outlook for the year 1930 is cause for optimistic reflection for the contractors and builders of the country. In view of the proposed estimate of over two billion dollars for street and highway construction and one and one-half billion dollars by the electric railways and gas industries, also the contemplated expenditures by the steam roads of the country of approximately two and one-half billion, promises to keep the dirt flying and the contractors exceptionally busy during the coming year.

The Cotton Belt Railroad has taken over the Deering & Southwestern Railroad in south Missouri and is rehabilitating the road. Winston Bros. Co. of St. Louis and Minneapolis have an outfit and a force of men on this work, realigning and raising tracks.

The County Board of Supervisors of Sangamon County, Illinois, has approved plans for nine road and bridge projects in that county. Bids will be asked for at an early date.

J. H. White & Co., it is reported, have plans, and will soon ask for bids for grading, paving streets, curbing, water, sewers, etc., for eighty-acre subdivision in St. Louis County, Missouri.

Armstrong No. 29 Blast Hole Drill



All Steel, Electric Arc welded. Full-length Alligator tread. Equipped with wire rope which saves 75% of Cable costs.

Ask for Bulletin No. 98, giving full details.

ARMSTRONG MFG. CO., 919 Chestnut Street Waterloo, Iowa, U.S.A.

SHOTS FROM THE FIRING LINE — Continued

The Board of Public Service, W. W. Horner, Engineer, St. Louis, has plans for a viaduct across the Missouri Pacific Railroad, the Frisco Railroad and River Des Peres at Hampton Avenue, to be of reinforced concrete; estimated cost $410,000. Bridges and viaducts at Lindell and Union Boulevards entrance to Forest Park and over Grand Drive in Forest Park at an estimated cost of $500,000.

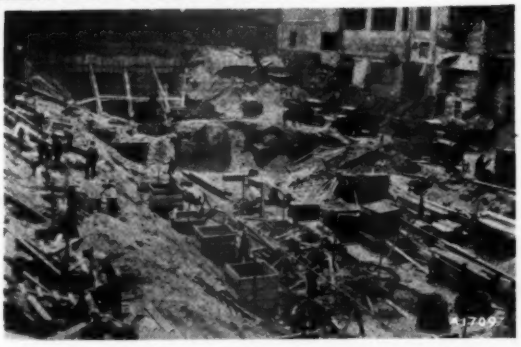
A. M. Spooner, 603 Lawton Street, Alton, Illinois, has a Keystone shovel and four trucks idle.

Winston Bros. Co. report that work on Section "L," Missouri Pacific Railroad cut-off, is progressing very satisfactory.

The Wabash Railroad plan the building of a bridge across the Missouri River between St. Louis and St. Charles Counties in Missouri. A reservoir and yards at St. Charles are also proposed. M. F. Longwill is chief engineer.

Minneapolis-St. Paul and Vicinity

BY WM. H. ZIEGLER COMPANY

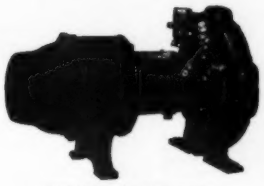


A little late, perhaps, are the above pictures showing **Connolly Contracting Company's** Bucyrus-Erie Gas + Air shovels excavating for the **Northwestern National Bank Building** at Minneapolis. This work was done early in the summer of 1929. You can readily see that there was hard digging to be handled, and anyone who knows the Connolly Contracting Company will assure you that Connolly's Macks roll the dirt out of this hole in short order.

And here is another picture showing the Bucyrus-Erie B-2 Steamer belonging to **Clement F. Scully Equipment Company of St. Paul** helping to enlarge the Minneapolis airport. Minneapolis, always a leader in progressive movements, is, of course, airminded, and has been trying hard to keep pace with her rapidly growing air traffic.

Best for 4000 Years!
The PLOW PRINCIPLE
The plow has proved itself the most economical digging tool.
The Power PLOW Scraper utilizes the plow principle, and, therefore, requires less line pull.
It is long and narrow and digs with a shearing action. It digs only until loaded, then rides on the surface, the load capacity controlled by the adjustable top.
Plow share points eliminate the need of teeth.
Write for further details.
THE GARST MFG. COMPANY
549 W. Randolph St.
Chicago, Ill.
LESS LINE PULL
Multiplied Capacity With Same Power Unit
Power PLOW Scraper

"an ABUNDANCE of Light"



MOON Turbo Generators
1 to 4 K W

"WE have used a Moon Generator for 7 years and it has given us good service with reasonable maintenance costs. It gives an abundance of light for night digging"—writes Mr. J.W. Lawlor, Vice-Pres. of the General Construction Co., Seattle.

Moon popularity in the construction field is built on its ability to handle a lighting job easily, economically and reliably.

Write for descriptive Bulletin No. 6-T.

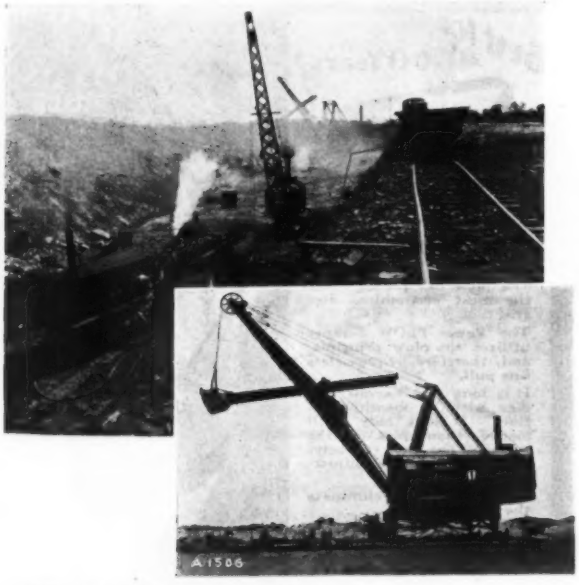
THE MOON MANUFACTURING COMPANY
114-128 No. Jefferson St., Chicago

MOON LIGHTING OUTFITS

SHOTS FROM THE FIRING LINE — Continued

Missouri Notes

BY J. P. MC CLOSKEY



Wheeling a Bucyrus-Erie 320-B steam on truck mountings across country is a weary job for pitman. J. C. Steel, operator, sends us the above photograph showing the Reliance Coal Corporation's machine which he operates moving across country to start stripping in another part of the property. We also show a picture of the new workings under way — train and Bucyrus-Erie 320-B steam in background, 50-B steam horizontal thrust coal loader in the foreground, and a Marion steam crane handling the skip from the loader.

Earle M. Gray, whose home is at Medford, Massachusetts, is operating a Bucyrus-Erie E-2 dragline for J. A. Kreis & Son on their Missouri Pacific job near Gray Summit, Missouri. The E-2, which has been working as a dragline, is at present being used as a clam.

Pacific Coast Notes

BY O. H. BARNHILL

H. W. Rohl, Los Angeles contractor, is grading a 2½-mile section of the La Canada Highway from Pasadena to the summit of the Sierra Madre range. There is much heavy rock work on this section of mountain road, one fill being 120 feet deep and containing 160,000 cubic yards. No overcasting is permitted because of the steepness of the mountains and danger of marring the scenery. Considerable concrete cribbing is used along the grade, which follows the Edison

THE SANDERSON CYCLONE DRILL CO., ORRVILLE, OHIO

DRILLS

and drill tools for every kind of Big Blast Hole Drilling

Catalog Mailed on Request

See these at the Show . . .

A NEW 5-AXLE TRAILER

Stronger, Without Extra Weight!

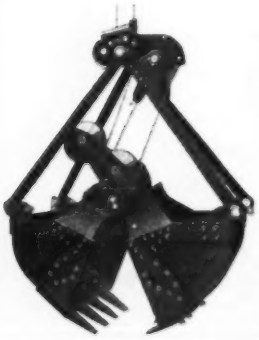
Big overload capacity: This WILLIAMS Trailer, rated 28 to 30 tons, has easily handled loads of more than 42 tons. It has *extra strength, without increased weight.*

Check up on this Heavy Duty 5-Axle Trailer at Booth 459, Exhibition Hall.

Besides seeing every good feature of modern trailer design in the WILLIAMS 5-Axle "Arch-Girder" Trailer, you'll note many new improvements which give *bigger load capacity* with no increase in the dead weight, and at no extra cost.

Beyond question you will rate the WILLIAMS "Arch-Girder" Trailer years ahead, for *convenience* and for *dependability.*

The New WILLIAMS "Champion" Buckets — Faster, more powerful, sturdier!



From the new head — even narrower than on the first WILLIAMS "Champion" Buckets, for greater rigidity — right down to the digging lip, the new "Champion" is even more rugged and powerful than the bucket introduced a year ago.

Inspect these new super-buckets at the Road Show. See how the greater Power and Speed are backed up by unequalled Stamina — making it possible for us to give these new "Champions" the strongest guarantee ever placed behind any bucket.

If you aren't going to Atlantic City for the Show, drop us a line for a description of the new WILLIAMS 5-Axle "Arch-Girder" Trailer, and the improved WILLIAMS "Champion" Bucket.

During the past year, the WILLIAMS "Champion" Bucket has proved itself an unequalled producer. And now — the *new improved* WILLIAMS "Champion" is introduced with many features that assure even better results. Be sure to see it at Booth 459, Exhibition Hall.

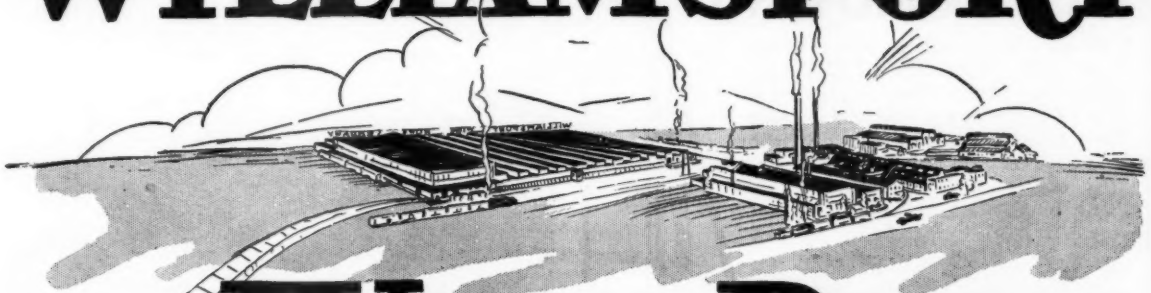
G. H. WILLIAMS COMPANY

WILLIAMS FAST-DIGGING BUCKETS

603 Haybarger Lane, Erie, Pa.

Branch Offices: New York, Pittsburgh, Chicago

WILLIAMSPORT



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FOR EVERY SERVICE—

You'll find to your liking, this wire rope and the service of a vast distributing organization reaching into every important center in America.

The Wire Rope with the Telfax Tape Marker

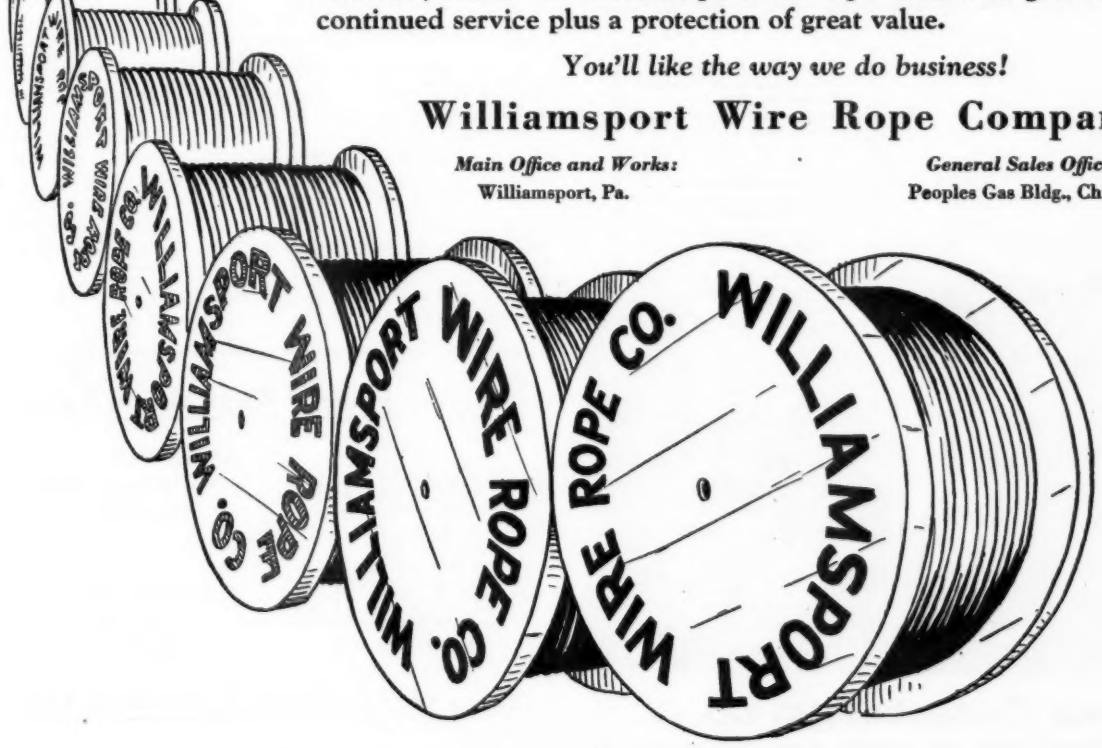
Giving the user a protection against substitution worth more than the rope costs. A product of such uniform superiority that the user unconsciously turns to Williamsport for ropes that will give long continued service plus a protection of great value.

You'll like the way we do business!

Williamsport Wire Rope Company

Main Office and Works:
Williamsport, Pa.

General Sales Offices:
Peoples Gas Bldg., Chicago



In writing to Williamsport Wire Rope Co. please use post card bound in the center of this number.

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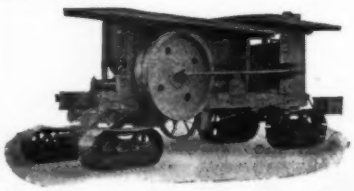
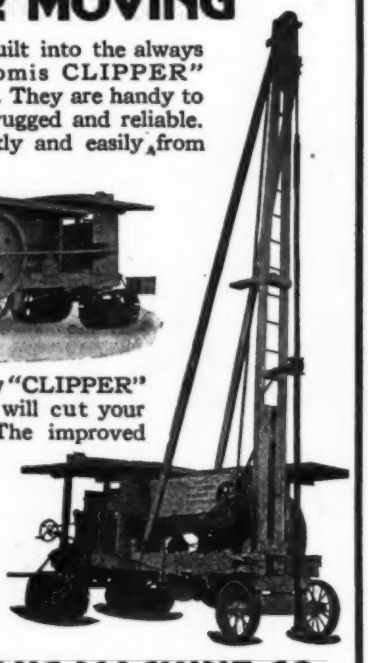
Real service is built into the always dependable "Loomis CLIPPER" Blast Hole Drills. They are handy to operate, simple, rugged and reliable. They move quickly and easily from hole to hole.





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The Hinged Bucket revolutionizes Past Methods.
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PAGE ENGINEERING CO. 844 RUSH ST. CHICAGO — ILL.
DRAG SHOVELS—DRAG LINES—BUCKETS—SLACK LINES—DIESEL ENGINES

SHOTS FROM THE FIRING LINE — Continued

Electric Company's power line most of the way. Excavation totaled 400,000 yards, and Mr. Rohl expects to finish the work in January. He is using Northwest and P. & H. shovels, 16 10-yard Sterling trucks, a McMillan bull-dozer, a Caterpillar 30 tractor and an Ingersoll-Rand compressor.

Fisher, Ross, MacDonald and Kahn, Inc., are making rapid progress on the $25,000,000 San Gabriel Dam which is now well under way. Four Bucyrus-Erie 50-B 2-yard electric shovels, one of which is shown above, and a Bucyrus-Erie Gas + Air are busily engaged in excavating the 1,200,000 yards of earth and rock necessary. This dam is the largest of the seven included in the flood control program of the Los Angeles Flood Control District and will require more concrete than any dam structure ever erected — a total of 3,800,000 cubic yards. The concrete plant for pouring will have a capacity of 2,000 cubic yards every eight hours, and will be erected together with a sand and gravel plant as soon as the 780,000 cubic yards of solid rock excavation, necessary before the concrete pouring may start, is close to completion.

Los Angeles and Vicinity

BY FORREST L. BEST

L. N. Cleveland of Concrete Machinery & Supply Company, Los Angeles, has just returned from an inspection tour of Arizona and says business is very good for this time of the year. Quite a number of State Highway jobs are going at present with J. C. Morse of Long Beach operating at Grand Canyon using a GA-2 Bucyrus-Erie Machine, A. M. Beals, operator; Pearson & Dickerson, Riverside, California, operating at Williams, Arizona. With operator Schippie at the levers of their Gas + Air we know things will move along in good shape.

Proctor Duell, Phoenix, Arizona, is using his Gas + Air machine on drainage work at Gillespie Dam.

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SHOTS FROM THE FIRING LINE — Continued

Hartman Construction Company, Bakersfield, submitted low bid to the California State Highway Engineer for highway construction near Lost Hills. They also have the grading for Fred Nighbert on his Little Lake Job, using P. & H. shovels for both jobs.

Allied Contractors, Inc., Omaha, Nebraska, were awarded contract by B. B. Meek, State Director of Public Works, at $239,792.50 for highway construction in Inyo County, to be graded and surfaced with oil-treated gravel, involving 122,000 cubic yards of excavation.

Western Construction Company, Maywood, California, were awarded contract for improving streets at Dana Point involving 183,555 cubic yards of excavation which will keep their 30-B Bucyrus-Erie going for some time.

Macco Construction Company, Clearwater, California, report everything going along good on their Kettleman Hills pipe line job, total length of which is 74 miles. They are using their Bucyrus-Erie 1030 for lowering the pipe into the trench, and a Buckeye ditching machine for the trenching.

Jack Sutherland, Salinas, California, was a caller in Los Angeles looking up old friends. Recalling to the writer of meeting Jack on the Southern Pacific Railway location job at San Carlos, Arizona, when the weather was somewhat hotter than it is now. But hot weather does not stop that chap when he has a job to do, like he had down there for the Utah Construction Company. Best regards, old man, come in again.

C. G. Willis & Sons, Los Angeles, was awarded contract for highway construction in Ventura County involving 650,000 cubic yards of excavation. Chas. Pettit, Ventura County Engineers, in charge.

The Griffin Company of Los Angeles are busy in and around Los Angeles with all their equipment going full speed. Where there is paving to be done, there you will find the Griffith Company.

Ernest Ward of Los Angeles has two Bucyrus-Erie machines on the Rose Canyon job at San Diego, and talk about moving dirt, say we'd be afraid to tell you what he is doing. You might not believe it, but at that Mr. Ward did take time enough to come to Los Angeles to see the Walker-Hudkins battle — and some scrap!

George R. Curtis Paving Company of Los Angeles was awarded the contract for grading and paving in Coldwater Canyon.

The Lewis Construction Company, Los Angeles, have secured a contract for grading in the Baldwin Hills, with Bill McKinley as superintendent and Bob Robertson as shovel operator. He has a combination hard to beat.

San Francisco and Vicinity

BY D. W. EVANS

The Linden Irrigation District was formed October 3rd. Fred Tibbets, Alaska Commercial Building, San Francisco, is engineer; A. L. Cowell of Stockton is attorney. The District comprises 12,000 acres of highly developed orchard land between Mormon Crannell and old Calaveras River. The District will work out agreement with the City of Stockton for use of Calaveras Dam so water can be released to replenish underground supply. Surveys are now being made.

J. P. Holland, Inc., of San Francisco have moved their Bucyrus-Erie Gas + Air shovel to Petaluma where it is working in a rock cut on the job Hollands are handling for the Hanrahan Company. Jim Murdock and Ed Kipfer are keeping the machine moving two shifts a day.

Application has been filed by the Northern Pacific Railway, St. Paul, Minnesota, with the Interstate Commerce Commission at Washington, D. C., for permission to extend its lines a distance of 150 miles from Brockway, Montana, to Lewiston, Idaho. Estimated cost of the above work is $6,000,000.00.

Bonds have been voted by the Gila Bend Water Conservation District, Gila Bend, Arizona, in amount of $365,000.00 for the acquisition of lands and the construction of irrigation system, involving canals, wells, pumping plants and distributing systems. Edwin D. Green is secretary of the Gila Bend Water Conservation District.

Stewart and Nuss of Fresno expect to keep their ¾-yard Bucyrus-Erie Type 1030 gasoline shovel busy on several jobs in the neighborhood of Fresno.

The Engineering Department of the **Pacific Gas & Electric Company, San Francisco,** will start construction soon on a single arch concrete dam to be 100 feet high, 500 feet long on crest, to be known as the Lyons Dam, and to be located on south fork of Stanislaus River, near Confidence, and four miles from Sonora, Tuolumne County. The dam will store 5500 acre feet of water, and will replace low timber crib dam. Work will be done by construction forces of the Pacific Gas & Electric Company, under O. W. Peterson, General Superintendent of Construction.

On the Salt Springs rock-fill dam the Pacific Gas and Electric Company has moved nearly a million tons of rock. This has been handled principally with two 4-yard Bucyrus-Erie quarry shovels. At present the rock is being moved at the rate of 140,000 yards per month.

NOTICE!

Index for The Excavating Engineer
Vol. XXIII — 1929

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1930 Highway Forecasts

(Continued from Page 30.)

for 1930 and $7,600,000 for 1931. Administrative and engineering costs are estimated at $1,800,000 during 1929, and budgeted at $2,000,000 for 1930 and also for 1931.

Texas

Because the sources of funds available for highway construction in Texas vary from year to year, the State Highway Department finds it difficult to know at any time the exact funds available, and are, therefore, unable to lay out a definite construction program. Funds available for highway improvement are derived from the State's share of automobile registration fees, gasoline tax and funds furnished by counties. During the past year up to August 31st, contracts were awarded for 1140 miles of grading and drainage structures, 184 miles of low type surfacing, 133 miles of asphalt surface treatment, 119 miles of asphalt pavement, 666 miles of concrete pavement, 4 miles of brick pavement, and in addition to the above contracts for a number of major bridges. This gives a total of 2246 miles designated as State Highway improvement, and involves a total expenditure of approximately $34,694,000. While it is hardly possible to forecast the funds available for 1930, it may be expected that approximately the same amount of funds will be available during the coming year, and the above figures may be taken as an approximate estimate of the work which will probably be let during 1930.

Utah

Utah's highway program for 1930 will involve a total expenditure of about $2,000,000. The new road program includes 77 miles of Federal Aid road to be graded at an expenditure of $616,000, and 23 miles of State road at an expenditure of $138,000. 100 miles will be graveled at a cost of approximately $4,000 per mile, making a total of $400,000 Reconstruction of 32 miles of Federal Aid will cost approximately $320,000, and 143 miles of State roads, $504,800. These latter figures include surfacing. New roads will require about 800,000 cubic yards of excavation, while reconstruction will involve 200,000 cubic yards, about 50 per cent of which is estimated suitable for shovel operation. In addition to the above about 230,000 cubic yards of excavation is carried over from previous contracts at an estimated cost of $100,000. Included in the $2,000,000 are five miles of paving and 100 miles of graveling.

Vermont

300,000 cubic yards of excavation for new roads and 25,000 cubic yards for reconstruction is expected to be necessary in Vermont's 1930 road program. Approximately 80 per cent of this work will be suitable for shovel excavation. 1929 work has all been completed, and there will, therefore, be no carryover into 1930. Vermont also expects to pave from 40 to 50 miles, and will do very little graveling during the coming year.

In Belmont County, Ohio, F. S. Amrine of Bridgeport handled this pretty piece of side-hill grading with a Bucyrus-Erie Type B, Caterpillar tractors, and Euclid wagons.

Virginia

The estimated funds available for highway work in Virginia for the fiscal year from July 1, 1930, to June 30, 1931, total $12,818,260. From this Supervision and Engineering will deduct about $318,260, and filling in gaps $1,000,000, leaving approximately $11,500,000 for distribution to the eight construction districts which is as follows: Bristol, $1,449,000; Salem, $1,613,150; Lynchburg, $1,444,400; Richmond, $1,685,900; Suffolk, $1,689,350; Fredericksburg, $844,100; Culpeper, $1,301,800; Staunton, $1,472,800.

Washington

The State of Washington will probably spend about $4,000,000 for building 142 miles of new roads during 1930. Of this 73 miles are Federal Aid and 69 miles are State Roads. In addition county roads will probably be built to the extent of about $13,000,000. Reconstruction of 400 miles of existing roads will probably cost $871,000, all of which work will be on State Highway. It is estimated that the work on new roads will involve about 5,000,000 cubic yards of excavation, and the reconstruction about 200,000 cubic yards. About 75 per cent of the total excavated will be suitable for shovel work. In addition to the above about 3,000,000 cubic yards is carried over on old contracts, involving an approximate cost of $4,000,000. Washington also expects to pave 47 miles of highways at a cost of $1,527,500, and to apply crushed rock and crushed gravel on 98 miles at a cost of $920,000, while heavy oiling will improve 310 miles at a cost of $635,500. 98 miles of grading and surfacing included in grading mileage are also included in the mileage of the crushed rock and crushed gravel.

West Virginia

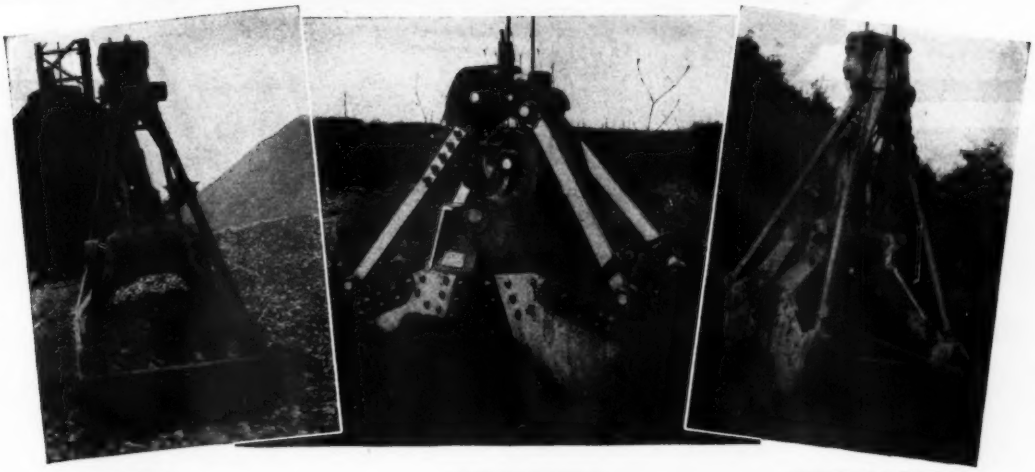
Heavy excavation is involved in the 1930 program of road construction for West Virginia. Approximately 1,680,000 cubic yards, about 90 per cent of which is shovel excavation, will be handled in grading 84 miles of State roads with an expenditure of $1,428,000. In addition 378,000 cubic yards of excavation will be necessary for the reconstruction program on 21 miles, which will cost $840,000. From 1929 contracts an additional 900,000 cubic yards of excavation is being carried over, which will cost $585,000. The bulk of West Virginia Federal Aid will be used on the paving program, which will consist of about 175 miles costing $5,000,000, and 165 miles of "Re-tread" surface treatment at a cost of $2,000,000.

Wisconsin

It is estimated that Wisconsin will grade approximately 140 miles of new road during 1930 at a cost of $960,000. Of this about 60 miles costing $480,000 will be Federal Aid, about 40 miles costing $320,000 State Roads and about 40 miles costing $160,000 county roads. The reconstruction, widening, and so forth, planned will improve approximately 810 miles, of which 200 miles costing $1,600,000 will be Federal Aid, 210 miles costing $1,680,000 will be State roads and 400 miles costing $1,600,000 will be county roads. The total excavation involved will probably run about 1,000,000 cubic yards for the new roads and 5,000,000 for the reconstruction. About one-half of this will be suitable for shovel operation. In addition to the above, 100,000 cubic yards at an estimated cost of $40,000 from old contracts will be carried over into 1930. Wisconsin plans 350 miles of new paving costing $11,700,000, which includes the grading and so forth — that is, the complete cost of the road. There will also be 300 miles of graveling which will cost $1,300,000. There is no information available on local road construction. Figures given above are what we believe to be a very good estimate, although the

(Continued on Page 54.)

Erie Buckets



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We also make Heavy Duty, Electric and Scraper type buckets for all kinds of service.

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Multi-Power—the low head-room, oversize scoop capacity bucket.

Heavy Duty—for Steel Mills or wherever an extra rugged bucket is required.

Scraper—for rehandling and clean-up work.

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Multi-Power—A bucket built especially where low head-room and oversize capacity is required. It has 13″ diameter sheaves throughout in the ½ and ¾-cubic yard sizes. Counterweights can be added of 100-pound increments in quantities from 200 to 600 pounds, to suit the type of digging.

This new bucket can be rigged up with from 2 to 6 parts of line and is faster with 6 parts of line than other buckets with 4 and 5. It will give excellent service in dredging and under-water work and also for general rehandling and excavating work.

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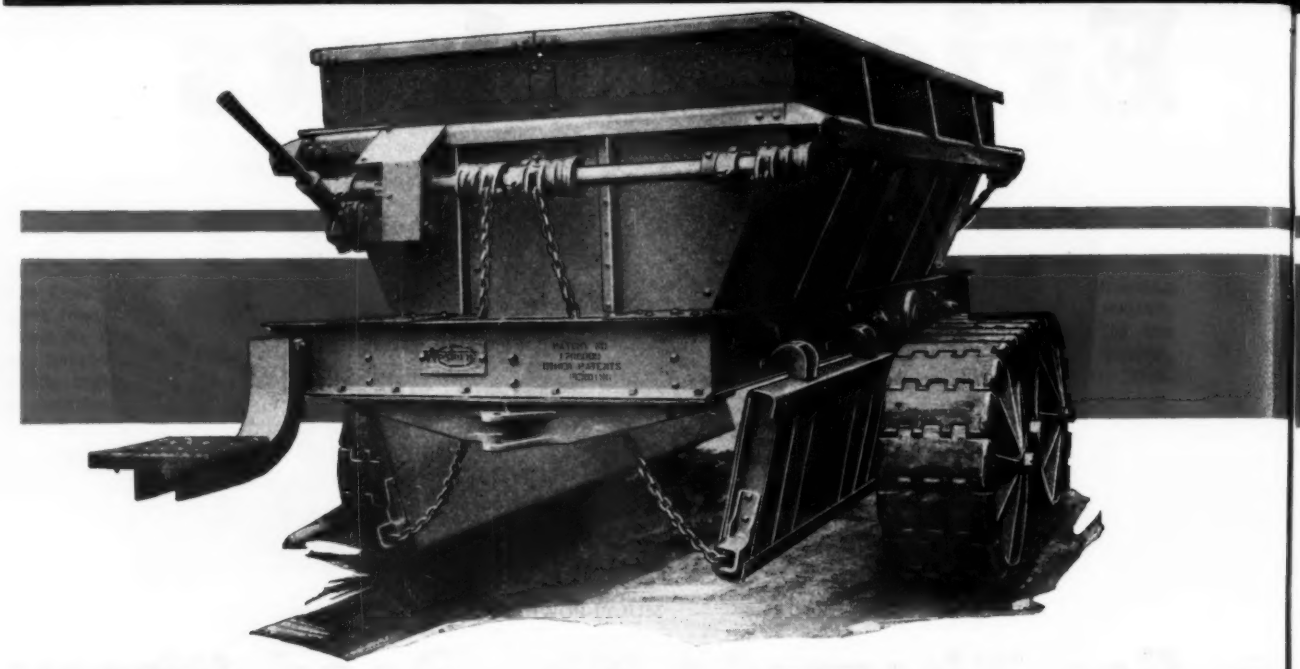

Watch the Unusual
of Western Crawler

The wagon shown above is of 7-cubic-yards capacity with direct tractor hitch. The 7-yard direct hitch wagon is similar to the 5-yard shown on the opposite page with the sides built up. The full top box is for power shovel loading. Notice the strength of the door construction. The drawbar casting, to which a second wagon can be hitched, is so designed that the strain of pulling a second wagon comes on the frame side channels and not on the rear cross channel.

THE year of 1929 again emphasized the operating efficiency of Western Crawler Dump Wagons. These wagons have changed competitive conditions more than any piece of earth-moving equipment that has been introduced in a great many years.

These huge tractor wagons with their ability to work under the most adverse haulage conditions have reduced the number of idle days during the working season. They have made work in the early spring and late fall profitable. And they have given the opportunity for a 24-hour working day if it is so desired, without increasing the amount of power and equipment on the job.

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DUMP CARS AND GRADING EQUIPMENT

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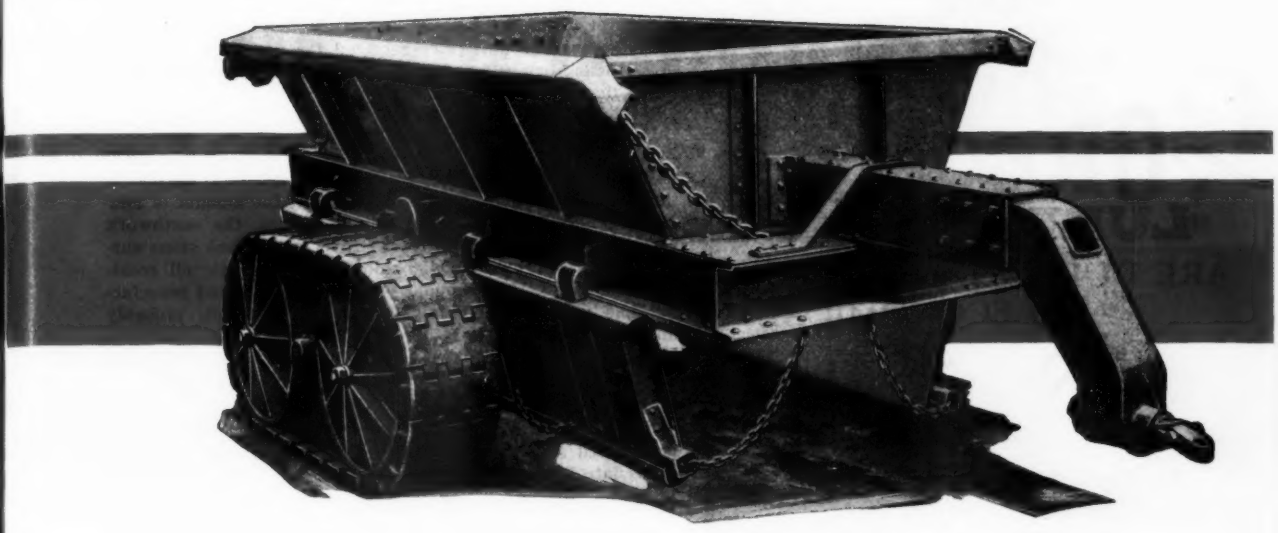

Service Records — Dump Wagons

Service records on the average job with the average management are proving the Western Crawler Dump Wagon a most efficient piece of equipment. The wagons may be operated in trains of two or three behind a 10-ton Crawler tractor when conditions are favorable, at double the speed of team-drawn wagons. If conditions become unfavorable, one wagon behind the tractor can carry on as long as the tractor can operate.

Watch the service records these wagons are making in all parts of the country. There are Western Crawler wagons working near you which can be seen on the job. You can also see this wagon at the Road Show in Atlantic City, and Bulletin 29-QK gives a complete description. If you can't actually see the wagon, write for the Bulletin.

Western Crawler dump wagons are built in the following sizes:

1. 5-yard with direct tractor hitch on 10-ton Athey Truss Wheels.
2. 7-yard with direct tractor hitch on 10-ton Athey Truss Wheels.
3. 7-yard with direct tractor hitch on 15-ton Athey Truss Wheels.
4. 7-yard with front truck on 10-ton Athey Truss Wheels.
5. 7-yard with front truck on 15-ton Athey Truss Wheels.
6. 10-yard with front truck on 15-ton Athey Truss Wheels.

Scraper Company
Illinois

WESTERN

Western

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NORDBERG MFG. CO., Milwaukee, Wis.

THE NORDBERG PATENTED
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1930 Highway Forecasts

(Continued from Page 50.)

county program is not yet prepared. It is interesting to note that the average unit price received for excavating for concrete roads during 1929 in Wisconsin was 43 cents, and roads other than concrete 37 cents.

Wyoming

The Wyoming highway construction program for 1930 will be approximately the same as for 1929. $1,900,000 is the amount available. It is expected that the amount of new grading and drainage will cover 120 miles, the earthwork involved being 2,000,000 yards. Gravel or crushed stone surfacing will approximate 190 miles, and asphaltic oil treatment 155 miles. The amount of reconstruction and resurfacing has not been definitely determined, but will probably approximate 75 miles.

Canada

Alberta

No program for Alberta's highway construction can be made until after the next session of the Legislature, which opens late in January.

New Brunswick

The Legislature of the Province of New Brunswick meets early in March and no program is available for publication until after that body passes necessary legislation. However, pronouncement has been made by the Premier of New Brunswick that the Government has decided to construct hard-surfaced highways throughout the province. A recent investigation has been conducted by the Provincial Minister of Public Works concerning the best methods to be pursued in connection with laying down "hard-surfaced" roads suitable to the topography and climatic condition of New Brunswick. From a careful study of conditions, it seems that "black base" material will be found most satisfactory; concrete has been rejected as unsuitable. At the coming meeting of the Legislature the Minister of Public Works will ask for authority to expend approximately $10,000,000 covering a period of five years, to reconstruct the main trunk highways, changing from gravelled roads to hard-surfaced roads, which will be dust-free and will meet the requirements of the increased motor traffic throughout the province. It is expected that the work will be commenced in the spring of 1930.

Nova Scotia

The department of Highways has at the present time no information concerning the 1930 program.

Ontario

Ontario's road work program for 1930 has not been arranged.

Quebec

The 1930 program for Quebec is not completed as yet.

Saskatchewan

The Saskatchewan Legislative Assembly does not meet until some time in the month of January, 1930, and not till after the estimates have been passed by the Legislative Assembly will the amount of money available for construction work for that year be determined. It is anticipated that an allotment will probably be made of about $5,000,000 (capital and revenue) for oil and gravel work surfacing, gravel and earth construction, timber and steel bridge construction, public ferry service, etc.

Fowl Omission

Landlady: "I'm sorry you do not think the chicken soup good. I told the cook how to make it. Perhaps she did not catch the idea."

Boarder: "No; it was the chicken she missed."

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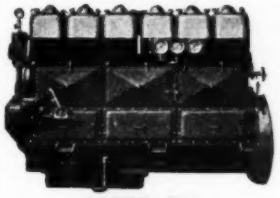
The 6-cylinder Atlas Imperial industrial full diesel.



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Chuquicamata—Where Giants Work

(Continued from page 19.)

Bucyrus-Erie 120-B heavy-duty quarry and mining shovel digging ore.

cease to wonder that it takes the 30-B Diesels to do it.

Liquid Oxygen Being Used to Replace Dynamite

For blasting the harder rock, liquid oxygen is used. The individual blasts are large. Black powder shots average 250,000 tons each. Dynamite shots dislodge masses averaging 80,000 tons each. Of late, Loxite has to a great extent displaced the dynamite.

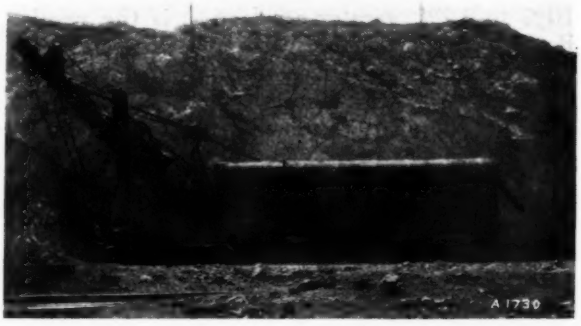
With two exceptions, all shovels being used at the present time are on caterpillar traction. The exceptions are a Bucyrus-Erie 320-B type, scooping up ore with a dipper that holds 8 cubic yards, and working sixteen hours out of the twenty-four, and an old-timer from the Panama Canal. The latter has been repaired and rebuilt until little remains of her but the old number. That number is Bucyrus 204. She was changed from steam to electricity. She is standing up well under her work, and the work is not easy. Right here it might be well to remark that at Chuqui, the secret of the sex of electric shovels was betrayed. Indiscrete engineers spoke of lip-sticks, skirts and bonnets. No wonder a shovel is a "she." A regular Amazon of a she — a powerful Katrinka — cave-woman stuff if you will. One must respect her.

The remainder of the fifteen second-hand railroad-type shovels and twelve engines brought from the Canal were scrapped after five or six years' use. Extravagant ladies they were, compared with the present-day equipment. Today they huddle together under a hill out of the way. There, the hot winds tear and shriek at them, and there they are likely to remain like the discarded wood and stone implements of the past, left where they were dropped by the workers' hands.

Loading ore with Bucyrus-Erie 6-yard electric shovel.

The Bucyrus-Erie 225-B types in use carry an 8-yard dipper and are on alternating current, while the 120-B type, with a 4-yard dipper, is on direct current. The Bucyrus-Erie 103-C railroad-type shovels carry a 4-yard dipper and are on alternating current.

Most of the shovels used at Chuqui are Bucyrus-Eries, but there are also some Marion railroad-type machines. Everything is electrically operated, with the exception of some of the locomotives used on the benches and the Diesels aforementioned. The power is produced by a Diesel plant located at the port of Tocopilla over one hundred miles away. The plant is claimed to be the second largest of its kind in the world. It was built about 40 years ago, and until recently was steam operated. Water for the boilers was obtained by distilling sea water and firing was with fuel oil. Two high-power lines carry the current to Chuqui, where huge transformers change the direct to alternating current.



Bucyrus-Erie electric railroad-type shovel on caterpillar mountings cutting out one of the mountain terraces.

Ore is brought from the benches to the crusher. After crushing it is processed in huge leaching vats, after which it is put through the smelter.

Altogether Chuqui is the most wonderful thing of its kind that there is. It is too large to give a detailed impression of. The proper way to view Chuqui would be from a captive balloon. One that would gently float at a rope's end for several hours so that one might get a good look-see.

A Curiosity

Young: "One of those show girls is going to ride down the street this noon on horseback, dressed in one of the original seven veils."

Old: "Fine. I'll be there. I haven't seen a horse for years."

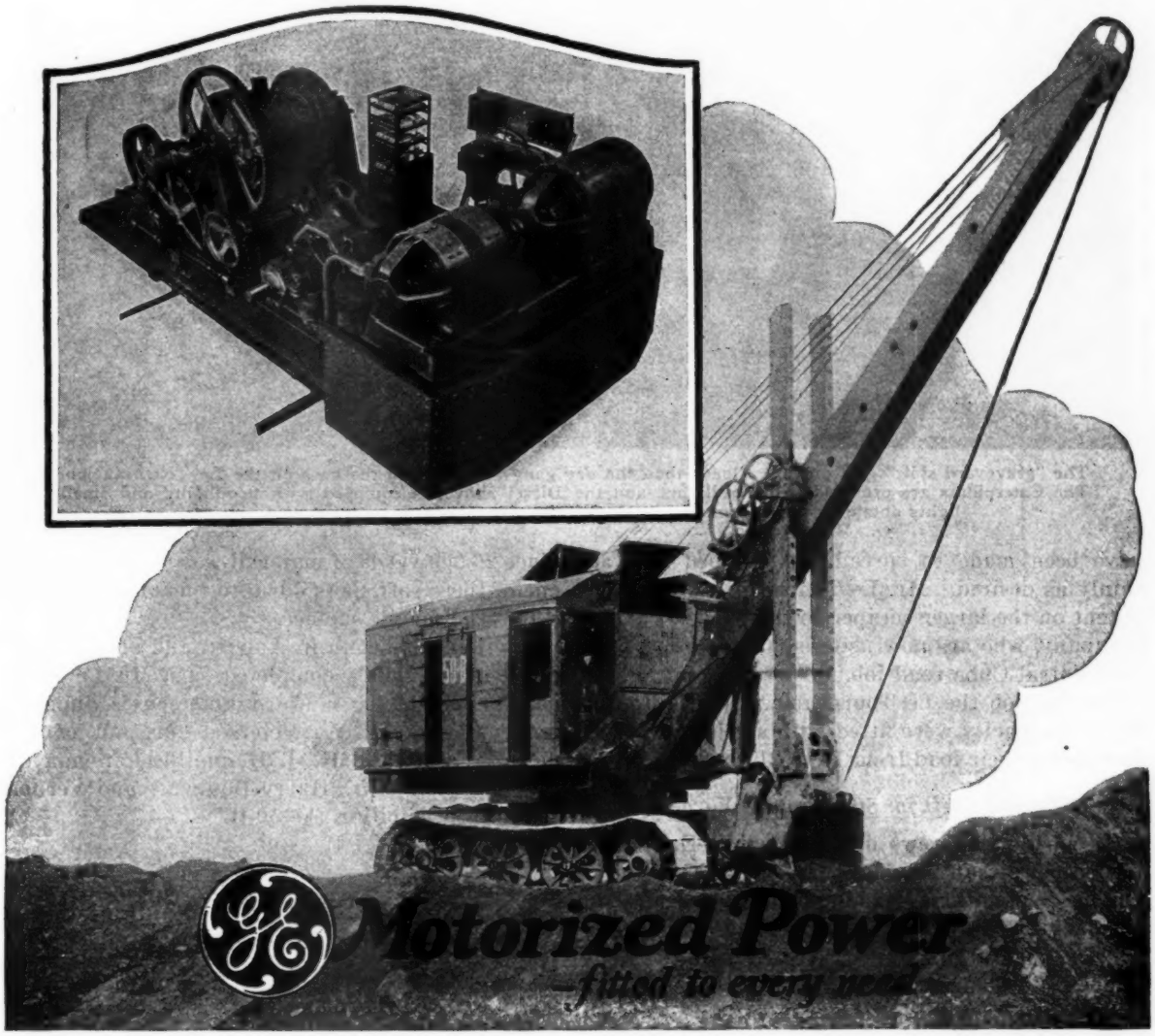
Behind the Bucket

What's behind the bucket of your shovel as it chews its way into an excavating job?

There—back of the bucket—at the heart of the shovel—that's where you want unfailing reliability.

And you'll find it there if your machine is G-E equipped—with G-E Motorized Power.

Unfailing reliability, dogged strength, close control, simplified design, and economy of operation—that's G-E Motorized Power, and that's why it is almost invariably specified for electric shovels.



200-218

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN PRINCIPAL CITIES

In writing to General Electric Co. please use post card bound in the center of this number.

California contractors rush grading of Southern Pacific bridge approach

(Continued from Page 21.)

The "graveyard shift" gets out more loads than the day gang according to the boss on the Le Tourneau job. The Caterpillars are provided with headlights, and the Diesel shovel is equipped with floodlights and small lights obtaining power from a Lincoln Welder plant mounted on the running board.

have been made to spread the dumped dirt as thinly as desired. Mr. Le Tourneau has sold the patent on the larger scraper to the Kaiser Paving Company, who are now using similar scrapers on the Central Cuba road job.

On this job the Le Tourneau wagons built for 16-yard capacity were fitted with sideboards, thus increasing their load from 16 to 21 yards.

Record Shift for 50-B Is 6060 Yards

As a rule the crews of the Bucyrus-Erie 50-B loaded more than 200 loads in each 11-hour shift. On one September day they put out 276 loads, or a total of 6060 yards. The hauling was on an average 1,500 feet. During both August and September, Le Tourneau moved more than 100,000 cubic yards of material.

The job has not been without unusual difficulties. In some places, the marshy land across which the fill was built, was found to be more than usually soft. In places the dumping of grade material forced the marshy land on either side to erupt in large "boils." It is estimated that in one place 25,000 yards of material was "lost" in filling one of these soft spots down to the subsoil 18 feet below the marsh surface.

The job was begun in August, and at this writing it is practically completed. On Mr. Le Tourneau's Benicia job Howard Peterson is Superintendent, with O. W. Peterson foreman of the morning shift and H. J. Heinmiller foreman on the afternoon shift. Harry Boulware and Vernon Isgren are handling the 50-B.

One man handles both tractor and dumping arrangement on this large capacity dump wagon which breaks away from the traditional type.

Roebling

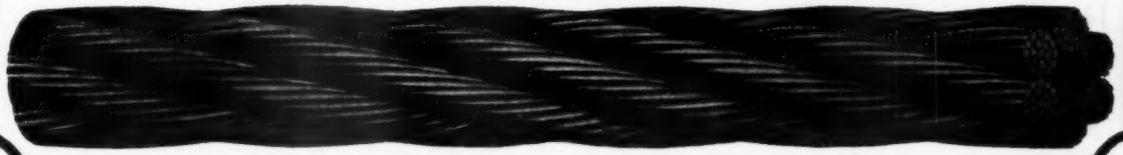
"Blue Center" Steel Wire Rope

The excavating field might be termed a testing ground where inferior ropes fail with short hours and yardage to their credit, but where "Blue Center" Steel Wire Rope with its high fatigue qualities has demonstrated its superiority and particular fitness for this exacting duty.

Made in small acid open hearth furnaces, the wire is painstakingly drawn and fabricated into the finished rope of a construction best adapted to the requirements of each size and type of shovel and excavating machine.

By reason of the uniform high records obtained in the field, Roebling "Blue Center" Steel Wire Rope is the standard equipment of many of the largest manufacturers of excavating machinery.

John A. Roebling's Sons Company
Trenton, New Jersey



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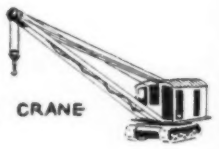
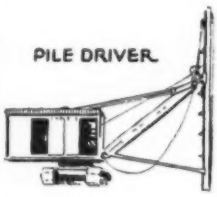
Steady, Firm Stick-to-it-iveness

That "knows when to let go"

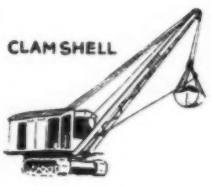
When a brake or clutch takes hold with easy firmness, holds like grim death and then lets go with the same smoothness and ease with which it took hold, you know you have a good asbestos block. If in addition to this you have a block that stands up under the severest service you know that you have the best there is to be had for excavating machinery brake and clutch linings.





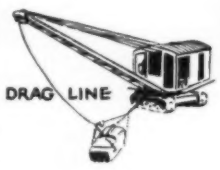
ASBESTOS

blocks and linings are the result of the most careful selection that we know how to make. They are exactly suited for the machine for which you buy them.



Why Experiment?

Friction materials sold by us for use on excavating machinery are selected only after the most careful experiment—the most careful trying out of the material in actual field service. You can take advantage of this work of ours, gain the benefit of our careful study by purchasing your blocks and linings from us—they cost no more.



Write now for quotations.

BUCYRUS-ERIE COMPANY

BUCYRUS ERIE

Specialty Department
South Milwaukee
Wisconsin

TRADE NOTES

The Sterling Motor Truck Company of Milwaukee announce the opening of a new home for their Pittsburgh branch, which is located at the corner of Liberty Avenue at 36th Street. They were located for a number of years at Forbes Field, and according to H. C. Keenan, Vice-President, increased business in Pittsburgh and vicinity demanded larger and more elaborate quarters. Their new building has just been completed, and is one of the most complete truck headquarters in the city. It is of brick and steel construction, with 25,000 square feet of floor space, and has a paved yard of 12,000 square feet. A large salesroom, office, shop and stock room are provided, and are so designed to create the utmost efficiency. This company maintains thirty-five factory branches throughout the country, and in addition distributes through dealers in many other large American and foreign cities what they claim to be the most completed line of motor trucks in the world. According to Mr. Keenan, Sterling sales for the fiscal year, ending October 31, show an increase of 50% over last year.

The G. H. Williams Company, builders of clamshell and dragline buckets and heating torches, announces removal of the Chicago branch office to new and larger quarters, at 614 Peoples Gas Building. Mr. C. F. Weiblen, manager of the Chicago office, is in charge. This change was made necessary by increased service facilities provided for Williams customers in the Middle West.

The Fate-Root-Heath Company, Plymouth, Ohio, manufacturers of Plymouth Gear Drive Gasoline and Diesel Locomotives, announces the completion of a new factory unit. Company officials state that this building, together with the new equipment now being installed, will double their present output.

The McKiernan-Terry Drill Company, of 15 Park Row, New York, recently changed its corporate name to **McKiernan-Terry Corporation** and acquired ownership of the National Hoisting Engine Company, of Harrison, New Jersey, and Steele & Condict, Inc., of Jersey City, New Jersey. The National Hoisting Engine Company and Steele & Condict, Inc., will preserve their identity to the extent that they will operate and be known as Divisions of the McKiernan-Terry Corporation, but with executive activities transferred to the sales offices of the corporation in New York. Arthur W. Buttenheim is President of the new McKiernan-Terry Corporation.

She Didn't Mind

A young London girl who was holidaying in the country became rather friendly with a young farmer. One evening as they were strolling in the fields they happened across a cow and a calf rubbing noses in the accepted bovine fashion.

"Ah," said the young farmer, "That sight makes me want to do the same."

"Well, go ahead," said the girl, encouragingly, "It's your cow."

"Will you have a cup of tea?" Old Man Woods asked politely.

"No tea," she answered.

"A cup of coffee?"

"No coffee."

"A whiskey and soda?"

"No soda."

Sweet girlish voice: "Is there no other way?"

Deep bass voice: "No other way."

Sweet girlish voice (coming faintly from the auto): "Oh, I can't. Never, never in this dark. I, who am used to the straight road. I will give you my purse, my rings, all of them, if you do not ask me to do this terrible thing."

Deep bass voice: "No, young lady, orders is orders. This concrete isn't hardened yet, so you'll have to detour."

BOOK REVIEWS

The law relative to buying and selling on the instalment plan in each of the 52 states of our country is attractively set forth in **"Conditional Sales" by Roger Sherman Hoar,** which has just appeared from The Ronald Press.

We say 52 states advisedly, for we learn from the book that, in addition to the 48 regular states, there is one special set of laws applicable to Minneapolis, St. Paul and Duluth, as distinct from the rest of Minnesota, and one special set applicable to the five counties of Greater New York City, as distinct from the rest of New York State. Alaska and the District of Columbia constitute the other two jurisdictions covered.

The book is written in the same popular style as Mr. Hoar's book on "Patents," which has had such a phenomenal sale, and in which he debunked the patent law, and explained it in plain English for the benefit of inventors and business executives. But "Constitutional Sales" contains, in addition, sufficient footnotes to set forth the legal authority for every statement made in the text.

Senator Hoar will be remembered as a frequent contributor to our columns, on the mathematics of excavation, and the mechanical principles involved in certain types of excavators.

Of probable interest to our readers is the following statement on page 250:

> "There is a persistent misapprehension on the part of conditional buyers that the retaking clause is inserted in the contract for their benefit, and that accordingly all they have to do, in order to get out of having to pay any further instalments, is to return the goods. Although such a settlement will often be welcomed by the seller, the buyer has no such right."

The book is one which no habitual buyer or seller on the instalment plan can afford to be without. The size is 521 pages, and the price $10.00.

Safe and proper use of explosives is covered in **"Commercial Explosives: Their Safe and Proper Use,"** a new booklet just issued by the **Hercules Powder Company, Wilmington, Delaware.** This booklet is intended to aid users of explosives in improving blasting practices and avoiding accidents.

The new booklet defines explosives, lists the various types and their characteristics, and offers directions for loading, priming, and firing. Modern types and processes are enumerated.

Handling and storage of explosives is also covered and general safety rules cited, many of which are recommendations of the National Safety Council, the United States Bureau of Mines, and the Institute of Makers of Explosives. In addition the Hercules booklet offers information on detonators, blasting machines, and other blasting accessories.

Users of explosives may obtain copies of this 48-page booklet by writing to the Hercules Powder Company at Wilmington, Delaware, or the nearest Hercules sales office.

The Portland Cement Association has recently issued a 64-page general reference handbook entitled: "Cement and Concrete." There is a very enlightening history on concrete construction, which forms the introduction to a review of the varied uses of concrete. It also contains much valuable data on streets, highway and motor transportation upkeep costs. This information is presented in the form of graphs, charts and text pictures. The graphs on the original costs of concrete highways and their maintenance as compared to other types of roads are particularly worthy of road builders' attention. These charts have been prepared from state and federal highway reports stretching over periods of from five to twenty years.

Highway, bridge and construction engineers will be interested in Bulletin No. 13 recently issued by the Department of Engineering Research, University of Michigan, Ann Arbor, entitled **"A Practical Method for the Selection of Founda-**

POSITIONS WANTED

Address all box numbers % The Excavating Engineer at South Milwaukee, Wisconsin

Space under this heading is available at $4.30 per inch or fraction thereof.

Dragline and Shovel Operator

16 years' experience as shovel operator. Single, 36 years of age. Have operated practically all makes of machines, and have 10 years' experience as dragline operator. Can handle steam, Diesel, electric or gasoline machine. Have worked on highway and railroad grading, rock excavation in quarry, drainage and irrigation, and dredging and also gold dredging. Prefer position on Bucyrus-Erie Diesel, E-2, D-2 or 50-B or other Bucyrus-Erie machines. Capable of taking charge of repairing and erecting and can handle crews. Best of reference and can do own repairing. At present located in California, but will go anywhere except the Tropics. Box 2105.

Operator

5 years' experience on Bucyrus and Erie steam and gas shovels on highway and pit work. Prefer work on Bucyrus-Erie steam shovel in nearby state. Can do own repair work and furnish reliable references. Present location, Massachusetts. Box 2104.

Operator

3 years' experience on Bucyrus-Eries and Northwest draglines and shovels. Will go anywhere. Can do own repair work and furnish reliable references. Present location, Maryland. Box 2103.

Shovel and Dragline Operator

10 years' experience on Bucyrus-Erie gas-electric draglines, and 50-B Diesel shovels on irrigation and drainage canals, and gravel pit work. Prefer position on Bucyrus-Erie machine anywhere. Can make own repairs and furnish reliable references. Box 2108.

Operator

3 years' experience on Bucyrus-Erie and Marion shovels on excavating and grading work. Prefer work as operator on Bucyrus-Erie machine anywhere. Can do own repair work and furnish reliable references. Present location, Canada. Box 2101.

Shovel Operator

18 years' experience on Bucyrus and Marions in mining of all kinds and excavation for construction work. Will go anywhere, can do own repair work and furnish best of references. Now located in Ohio. Box 2110.

Dragline Operator

2 years' experience on Bucyrus-Eries 30-B and 50-B Diesel as dragline operator. Would like position on either Diesel machine in South America. Can do own repair work and furnish reliable references. Present location, Iowa. Box 2106.

Operator

5 years' experience on Erie shovels on highway and gravel loading work. Prefer operating B-2 machine in Central America. Can make own repairs and furnish reliable reference. Present location, Alabama. Box 2107.

Shovel Operator

10 years' experience on Bucyrus, Eries and Marion shovels on railroad, highway and gravel pit work. Will work anywhere. Can make own repairs and furnish reliable references. Present location, Missouri. Box 2102.

Operator

15 years' experience on Bucyrus-Erie shovels on railroad and quarry work. Will go anywhere in U. S. A. Can do own repair work and furnish reliable references. Present location, Missouri. Box 2109.

WHAT EVERY ELECTRICIAN WANTS TO KNOW!
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Theo. Audel & Co. 65 W. 23rd St. New York, Dept. 25

BOOK REVIEWS — Continued

tions Based on Fundamental Research in Soil Mechanics." The work done in the preparation of this bulletin was under the direction of W. S. Housel, Assistant Professor of Civil Engineering, and covers the physical properties which govern the bearing capacity of a cohesive or plastic soil such as clay. Tests made are well illustrated with photographs and graphs. The price is $1.00.

FOR SALE

Space under this heading is available at the following rates, payable in advance of publication:

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Address all box numbers c/o The Excavating Engineer at South Milwaukee, Wisconsin

Small Shovels
Under 2 yards

ONE MODEL 36 MARION, 1½-yard dipper on full revolving caterpillars.
TWO 18-B BUCYRUS, ⅞-yard dipper on full revolving caterpillars.
ONE 35-B BUCYRUS, full revolving caterpillars, 1½-yard dipper.
Box 505-A.

OSGOOD STEAM SHOVEL, shop No. 3102, mounted on cats. $3500.00, priced for quick sale. Located near Rochester, New York. Address Box 713.

BUCYRUS 20-B STEAM SHOVEL, shop number about 3980, on cats, 20-foot 6-inch boom, 15-foot dipper sticks, ¾-yard dipper. Little repair will put it in first-class condition. Now working in Upper Michigan. Priced for quick sale. Address Box 1206.

BUCYRUS 14-B STEAM SHOVEL, shop number 3595, mounted on cats, 18-foot boom, 12-foot dipper handle, and ¾-yard dipper. Located western Illinois. Priced to sell. Address Box 800.

TYPE "B" ERIE HIGH LIFT SHOVEL, No. 3354, 14-foot 6-inch boom, 18-foot dipper stick, ¾-yard manganese front dipper, on cats, in good condition, $3,500.00. Address Box 900.

MARION 37 STEAM SHOVEL, on cats, 28-foot 6-inch boom, 19-foot handle, 1¾-yard manganese front dipper, located near Pittsburg, Kansas. Machine used very little and in exceedingly good shape. Priced to sell. Address Box 805.

OSGOOD MODEL 18 TRACTION WHEEL REVOLVING STEAM SHOVEL, 20-foot boom, 17-foot dipper handle, ⅞-cubic-yard dipper, boiler recently refued and engines thoroughly overhauled. Machine in good working condition, located near Fort Smith, Arkansas. Address Box 1008.

OSGOOD 18 CATERPILLAR STEAM SHOVEL equipped with new treads and new boiler and dipper. Machine has been thoroughly overhauled and in first-class condition, located near Little Rock, Arkansas, price $3000.00. Address Box 1010.

TYPE "B" ERIE STEAM SHOVEL, shop number about 2510, caterpillar mounted; equipped with 17-foot 6-inch boom, 14-foot dipper handle, ¾-cubic-yard inserted tooth dipper and 1¼-cubic-yard lightweight dipper, and power boom hoist. Located southeastern Wisconsin. Priced cheap. Box 9-SS.

NORTHWEST GASOLINE SHOVEL, ½-cubic-yard dipper. Good condition, location New England. Box 6-SS.

1½-YARD HEAVY-DUTY OSGOOD SHOVEL, No. 1591. Boom 26 feet, dipper handle 22 feet and 1½-yard dipper; also 50-foot boom, dragline equipment. Price $3000.00. Machine in good condition and working every day at Flint, Michigan. Address Box 1003.

TYPE "A" ERIE STEAM SHOVEL, shop No. about 1900; on cats; equipped with 16-foot boom, 12-foot 6-inch dipper handle, boom hoist, and ⅝-cubic-yard dipper; located Milwaukee vicinity. Priced to sell. Address Box 1012.

TYPE "A" ERIE STEAM SHOVEL, ⅝-yard dipper, 16-foot boom and 13-foot dipper handle. Caterpillar type mounting. Completely rebuilt and with same guarantee as new machine. Immediate shipment. Located in Indiana. Address Box 305.

TYPE 3-A THEW, located near Pittsburg, Kansas. 31-foot boom, 24-foot handle, 1 cubic-yard dipper. Shop number 2150. Shovel used very little. Equipped with new boiler. For immediate delivery. Address Box 805.

MARION 26 STEAM SHOVEL, shop number about 2940. Equipped with 32-foot boom, 21-foot handle, mounted on 5-foot traction wheels. Can be inspected at Pittsburgh, Pennsylvania. Machine in excellent condition, ready for immediate delivery. Address Box 600.

BUCYRUS 14-B STEAM SHOVEL, revolving type, ¾-yard. Serial number 1595, tractor type. Requires new boiler. For sale "as is" at a bargain. Located near New York City. Address Box 1207.

BUCYRUS 18-B CRANE AND SHOVEL. Machine equipped with standard boom and bucket on traction wheels. Shop number 1867. Also has extra 40-foot boom and clamshell bucket in good serviceable condition. Located Valpariso, Indiana. Box 201.

FOR SALE
OSGOOD 1¼-YARD STEAM SHOVEL on caterpillars, now working and can be inspected. Priced reasonable and can be handled on terms if necessary. Communicate with the **Wm. H. Ziegler Co., Inc., 619 Washington Ave., So., Minneapolis, Minnesota.**

MARION ELECTRIC SHOVEL, Model No. 36.
MARION STEAM SHOVEL, Model No. 36.
Location Central Ohio. Box 1204-A.

MARION STEAM SHOVEL, Model No. 36. 1½-yard bucket. Location Ohio. At a bargain price. Box 1205.

1¼-YARD OSGOOD "HEAVY DUTY" STEAM SHOVEL, caterpillar mounted, 26-foot boom, 18-foot dipper handle, 1¼-yard manganese Missabe dipper with Vanderhoef front. Shovel No. 1374. Shipped March 1924. Boom, dipper and dipper handle very good condition. Will make attractive price. Located in New England. Box 1200.

FOR SALE
THREE TYPE B ERIE HIGH-LIFT SHOVELS. Shop numbers 1486, 1819 and 2166. Mounted on Cats. Prices reasonable. Located in Pennsylvania. Box 7-SS.

BUCYRUS-ERIE 30-B DIESEL COMBINATION SHOVEL AND DRAGLINE. Shop No. 4536. Equipped with 31-foot boom, 17-foot dipper sticks, 1-yard plate dipper. Also 40-foot dragline boom for this machine. Good working condition. Box 3-SS.

TYPE B ERIE HIGH-LIFT SHOVEL. Shop number 1475, traction wheels. At a bargain price. Located in Pennsylvania. Box 8-SS.

MARION SHOVEL, Model 220 or 212, Shop No. 3141. In first-class condition. 45-foot camel-back boom, 28-foot dipper sticks, 1¾-yard dipper. Also dragline boom for this machine. Box 805-C.

TYPE "B" ERIE STEAM SHOVEL, shop number about 2450, mounted on cats, 19-foot 8-inch boom, 16-foot dipper handle, 1-cubic-yard dipper, and power boom hoist. Machine in A-1 condition. Located vicinity Rock Island, Illinois. Address Box 317.

1¼-YARD TRACTION TYPE MODEL 36 MARION SHOVEL No. 3737. $2,500.00.
Address Box 314.

BUCYRUS 30-B DIESEL SHOVEL, 29-foot boom and 18-foot handles, ⅞-yard dipper. Located in Indiana. Completely rebuilt. Carries same guarantee as new machine. Immediate shipment. Address Box 308.

ERIE TYPE "B" FULL-REVOLVING STEAM SHOVEL, shop number 1837, on cats; 17-foot 6-inch boom; 14-foot dipper handle; ¾-yard new dipper.

OSGOOD No. 18 FULL REVOLVING STEAM SHOVEL, shop number 1203, mounted on new caterpillar type trucks; 19-foot boom; 13-foot dipper handle, ¾-yard dipper; complete; standard specifications.
All above f. o. b. cars, shipping point in Virginia. Address Box 319.

20-B STEAM SHOVEL, No. 3963, was shipped from Evansville on June 30, 1923. It is mounted on caterpillar-type truck equipped with an 18-foot boom, 12-foot 6-inch dipper handle and 1-cubic-yard plate front dipper (no boom hoist). Now stored in North Milwaukee, Wisconsin, where it can be inspected. Address Box 703.

MODEL No. 21 MARION STEAM SHOVEL, high lift boom and forward drum, in excellent condition, boiler just retubed, location Baltimore. Price $5,000.00. Address Box 1101.

MODEL 105 NORTHWEST GASOLINE SHOVEL with 1-cubic-yard dipper. Southern location. Machine can be seen in operation. Attractive proposition to responsible parties. Address Box 1225.

GAS + AIR HIGH-LIFT ERIE SHOVEL, new caterpillar-type mounting. Completely rebuilt. Ready for immediate shipment. Address Box 304.

Small Draglines
Under 2 yards

MODEL 207 P. & H., Shop No. 2066, 40-foot boom dragline, including 1¼-cubic-yard drag scraper bucket. Machine now working. Located in eastern Montana. Price $3000.00. Address Box 1001.

50-B STEAM DRAGLINE with 55-foot boom, 1½-yard Page drag bucket and light plant; location Detroit, Michigan. Box 1203.

BUCYRUS-ERIE 30-B DIESEL COMBINATION DRAGLINE and Shovel. Shop No. 4536, equipped with 31-foot boom, 17-foot dipper sticks, 1-yard plate dipper. Also 40-foot dragline boom for this machine. Good working condition. Box 3-SD.